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ORIGINAL COMMUNICATIONS.

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CONTRIBUTIONS TO THE STUDY OF THE SPHENO-PALATINE GANGLION.*

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The sphenopalatine ganglion is the second largest nerve center in the head, and the largest nerve center outside of the cranial cavity. As such, it assumes a position of greatest importance to the nose and throat specialist. It innervates and is intimately connected with practically every region treated by the oto-rhino-laryngologist. It's distribution is so extensive as to give symptoms directly and reflexly to practically every part of the body. It involves most of the cranial nerves, the cranial and visceral autonomic system and some of the spinal nerves, with remote effects produced through paths not yet traced.

The effects from the ganglion vary from neuralgias of the face to the production of myalgic nodules in the trapezius and sterno-mastoid muscles, simulating rheumatism, disturbances of hearing, itching in the external auditory canal, neuralgias of practically every region of the head, vasomotor nasal engorgement or rhinorrhea and systemic effects such as nausea and vomiting, reflex asthma and dysmenorrhea. In fact, when one considers the multiplicity of symptoms that can be relieved by treatment of the ganglion one is hardly willing to admit to oneself that the cases were not those of hysteria. Yet a careful control rules out hysteria in practically every case. As Sluder very recently pointed out, not only can we not explain the

*Reported from the Research Club of the New York Post-Graduate Service of Dr. C. J. Imperatori.

variety of symptoms, but even the mechanism whereby cocainization or the application of silver nitrate to the sphenopalatine ganglion district permanently relieves symptoms arising from disturbances of the ganglion.

The ganglion has four main groups of branches; an internal or nasal group, a descending or palatine group, a posterior group and an anterior or orbital group. Each group must be studied to understand the effects of the ganglion. The internal or nasal group sends a number of branches, the largest of which is the nasopalatine nerve through the sphenopalatine foramen to pass medially across the lower part of the anterior wall of the sphenoid to the septum, thus supplying the major portion of the septum. From the same group also arise branches to the middle and superior turbinates, superior meatus, sphenoid sinus and posterior ethmoidal cells. The nasopalatine nerve, passing as it does, obliquely across the septum in a groove in the vomer and septal cartilage and through the anterior palatine foramen where the nerves of each side meet and form a small plexus, reaches the roof of the mouth, and supplies, in addition to the septum. the anterior portion of hard palate and incisor teeth.

The descending or palatine group of branches from the sphenopalatine ganglion comprise three large nerves, the anterior, middle and posterior palatine. These three branches associated with the posterior inferior nasal nerve descend almost vertically from the sphenomaxillary fossa into the pterygopalatine or posterior palatine canal. The posterior inferior nasal nerve leaves the canal through a small perforation to be distributed to the posterior two-thirds of the inferior turbinate and inferior and middle meatus. The nerve runs along the superior margin of the turbinate. The anterior palatine, which is the largest branch, emerges at the posterior palatine foramen to be distributed anteriorally over the roof of the mouth and medial side of the gums. The middle palatine nerve leaves the pterygopalatine canal to enter a small accessory palatine canal and emerge on the small pyramidal process of the palate bone to be distributed to the soft palate, uvula, upper two-thirds of the faucial tonsil and pillars. The posterior palatine nerve also leaves through a small accessory palatine canal and is distributed to the same area. In addition to sensory fibres, this nerve also contains motor fibres supplying the levator palati muscle.

The posterior group also sends several branches to the extreme superior part of the nasal cavity, nasal septum, sphenoid sinus and a pharyngeal branch to the nasopharynx, superior part of pharyngeal wall and medial part of Eustachian tube.

The anterior or orbital group consists of a number of small branches which leave the ganglion passing upward and anteriorly through the inferior orbital fissure supplying sensation to the periosteum lining the orbit, and some branches passing into the posterior ethmoidal cells.

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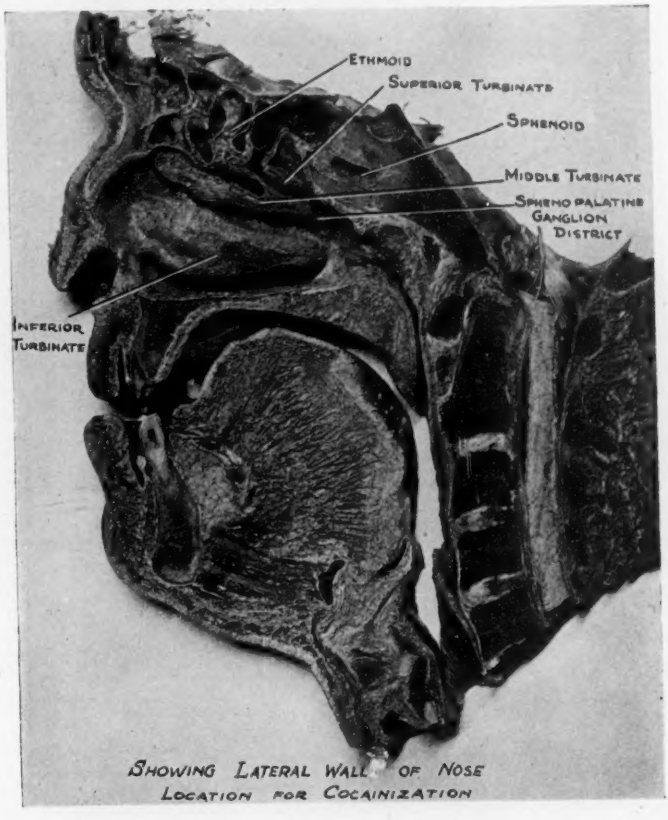

Arnold and Longet describe some branches passing upwards to be distributed to the neurilemma of the optic nerve. Bock and Valentine have observed a branch from the ganglion to the sixth nerve. Tiedman found a branch from the sphenopalatine to the ciliary ganglion. Luschka describes two or three branches, spheno-ethmoidal ascend-

ing to the superior portion of the internal orbital wall passing through the posterior ethmoidal foramen and entering the brain case.

The composition of the ganglion is likewise of very wide origin. The roots of the ganglion are sensory, motor and sympathetic. The sensory roots are the two sphenopalatine nerves passing medially from the maxillary division of the trigeminal to the ganglion. Many of

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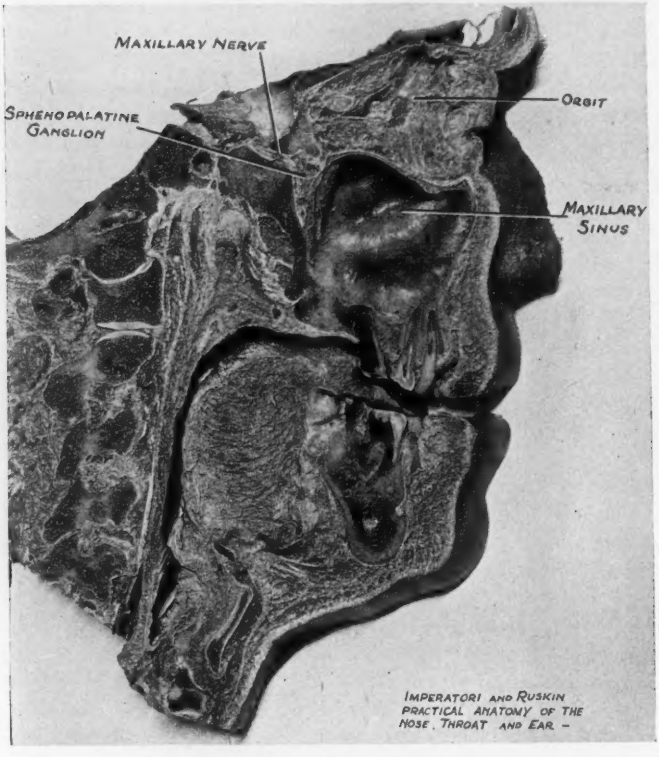

these fibres are not involved with the grey matter of the ganglion and pass through it to be distributed to the palate and nose. Another sensory root is derived from the geniculate ganglion on the facial nerve. The geniculate ganglion is located on the upper portion of the medial wall of the tympanic cavity at the first knee of the facial nerve. Here the facial nerve bends sharply posteriorly to pass along

the medial wall of the tympanic cavity towards the antrum of the mastoid, while the greater superficial petrosal nerve runs anteriorly from the ganglion through the hiatus fallopii to emerge on the anterior surface of the petrous portion of the temporal bone. It receives a twig from the tympanic plexus and passes beneath the semilunar ganglion to the outer side of the internal carotid artery. Here it is

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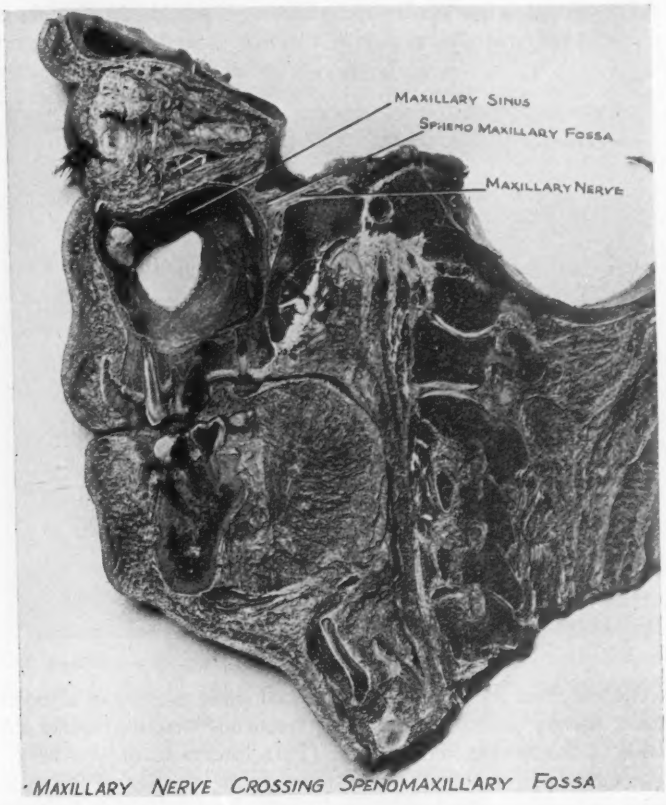

MAXILLARY NERVE CROSSING SPENOMAXILLARY FOSSA

joined by the sympathetic root of the sphenopalatine ganglion, the great deep petrosal nerve, and the united trunk called the vidian nerve enters the pterygoid (Vidian) canal to join the posterior part of the sphenopalatine ganglion. The ganglion may also receive fibres from the glosso-pharyngeal nerve conveyed to it through the small

and deep petrosal nerves. The connection is sometimes described as the third sensory root.

The great deep petrosal forms the connection between the superior cervical sympathetic and the sphenopalatine ganglion. Many of its fibres end in the arborizations around the stellate nasal ganglion cells, from which in turn axones pass to blood vessels and glands by way of the ganglionic branches of distribution.

A close study of the facial nerve from which the greater superficial petrosal arises aids in understanding the wide distribution of

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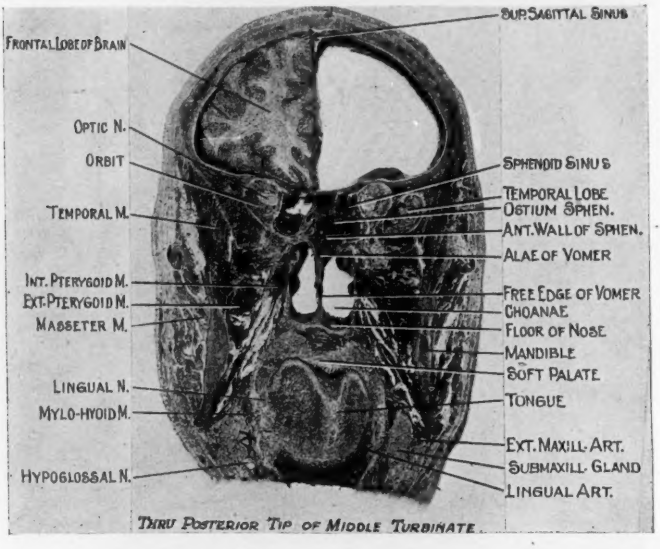

symptoms from the ganglion. The facial nerve consists of a motor and a sensory part, the latter being frequently described under the name of the Nervus Intermedium (Pars Intermedii of Wrisberg). The motor part supplies somatic fibres to the muscles of the face, scalp and auricle, the buccinator and platysma, the stapedius, the stylohyoideus and posterior belly of the diagastricus; it also contains some sympathetic motor fibres which constitute the vasodilator nerves of the submaxillary and sublingual glands and are conveyed through the chorda tympani nerve. The sensory root of the facial nerve with which we are most concerned arises from the geniculate ganglion

situated on the facial knee at the upper medial wall of the tympanic cavity. The cells of this ganglion are unipolar and the single process divides in a T-shape manner into central and peripheral branches. The central branches leave the trunk of the facial nerve in the internal acoustic meatus and form the sensory root; the peripheral branches are continued into the chorda tympanii and greater superficial petrosal nerves. The fibres of the sensory root pass into the substance of the medulla oblongata and end in the upper part of the terminal nucleus of the glosso-pharyngeal nerve and in the fasciculus solitarius. According to Arnold a twig runs back from the ganglion to the acoustic nerve.

The branches of communication of the facial nerve may be arranged as follows:

In the internal acoustic meatus	With the acoustic nerve
At the geniculate ganglion	With the sphenopalatine ganglion by the greater superficial petrosal. With the otic ganglion by a branch which joins the lesser superficial petrosal nerve. With the sympathetic on the middle meningeal artery.
In the facial canal	With the auricular branch of the vagus.
At its exit from the stylomastoid foramen	With the glossopharyngeal With the vagus With the great auricular With the auriculo temporal
Behind the ear	With the lesser occipital
On the face	With the trigeminal
In the neck	With the cutaneous cervical

In the light of such wide connections one begins to see how an irritation of the greater superficial petrosal root of the sphenopalatine ganglion can produce disturbances ranging from neuralgia of the face to that of the neck. The connections with the cilary and otic ganglions can account for disturbances in the eye and mandibular regions. The connection with the tympanic plexus reveals the source of the reflex otalgia. The connections with the vagus could probably account for the relief of laryngeal pains. The relationship with the lesser occipital and cutaneous cervical probably account for the pain in the neck. The difficulty in the situation lies, however. in explaining the causes of a reflex passing to such distant branches. There is this to consider. Although a patient will appear with signs of mastoidalgia from a sphenopalatine ganglion disturbance from

post-ethmoidal disease, still on close examination one finds that the whole sensory root of the facial and its many ramifying branches are more or less involved; so we see, the case presents, in addition to the prominent mastoidalgia, pain deep in the orbit, one-sided headache, or sense of oppression, stuffiness in the ears or slight disturbances in hearing, pain in the occipital region, and pain in the muscles

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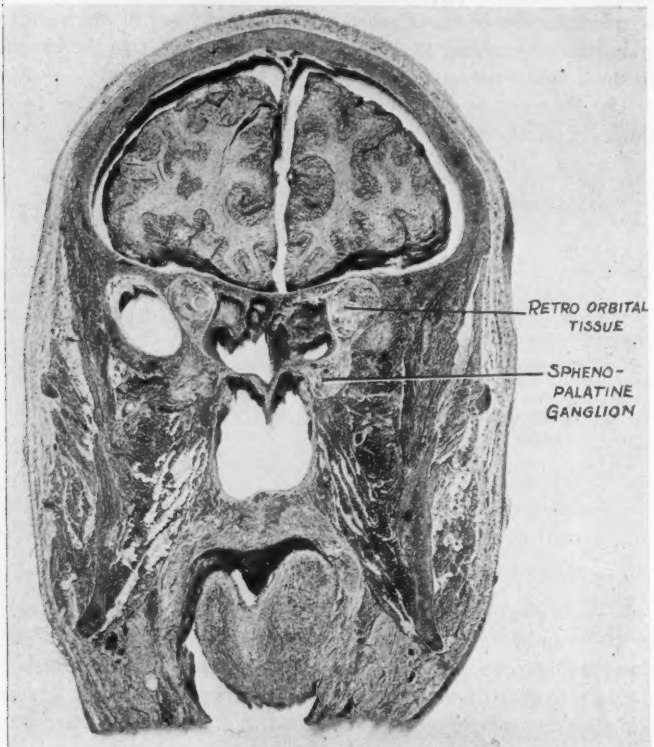
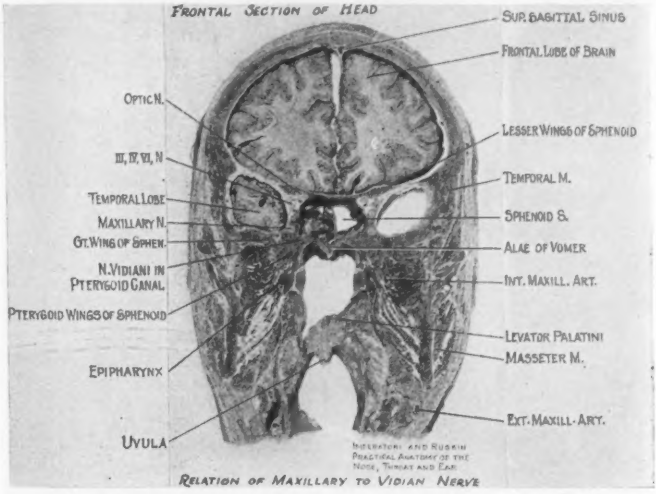


RELATION OF SPHENOPALATINE GANGLION TO THE RETRO, ORBITAL STRUCTURES.

of the neck and shoulder. occasionally also, nausea and palpitation. In one case there was in addition a severe tic doloreau involving almost all the muscles of the face. We must therefore consider the syndrome somewhat as a sensory facial nerve disturbance induced by the irritation of one of its branches, the greater superficial petrosal

at its ending in the sphenopalatine ganglion. The relief of the entire syndrome of so-called sphenopalatine ganglion neuralgia by cocainization of the ganglion is equivalent to anesthetizing the terminal branches of the greater superficial petrosal nerve, and thus excluding the irritations that ordinarily travel to the sensory part of the facial through that route. We thus see that sphenopalatine ganglion neuralgia is in some cases really sensory facial nerve neuralgia. In similar manner, we must consider a maxillary neuralgia and a neuralgia from the sympathetic root. Each of the three present distinct pictures, or a combination of two or three.

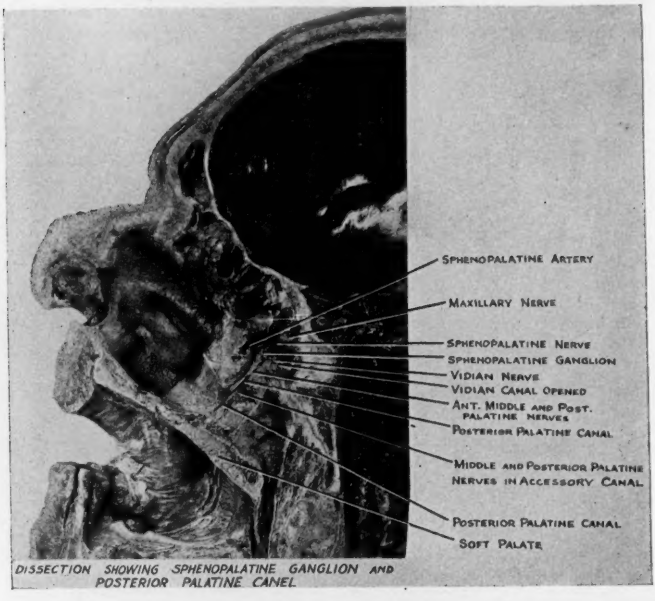
One must consider that here in the nose is exposed a large terminus for three great systems, the trigeminal, facial and sympathetic. No-



where in the body is there such a large nerve center exposed so superficially. In addition to its being superficial it lies in an area very frequently subjected to disease processes. Nowhere else does the sympathetic nervous system come within such close range for treatment. The deep petrosal nerve, coming as it does from the sympathetic plexus around the carotid communicates with the cervical sympathetic superior middle and inferior ganglia, and through the last with the first thoracic nerve supplying fibres to the heart and lungs. Hay-fever and asthma both manifest themselves by signs of sympathetic disturbances in the nose and chest. Likewise cardiac pains such as angina pectoris and gastric pains suggest themselves

as possible conditions amenable to treatment through the sympathetic connections in the sphenopalatine ganglion district. Dr. Imperatori has suggested cardiospasm as amenable through this route. How cocainization of the ganglion is able to permanently affect such distant branches is enigmatic, the fact however that it does remains to spur us on to more diligent research.

To summarize we must consider sphenopalatine ganglion disturbance not as an entity but rather as a combination of four different factors; a trigeminal maxillary syndrome, a sensory facial nerve



DISSECTION SHOWING SPHENOPALATINE GANGLION AND POSTERIOR PALATINE CANEL

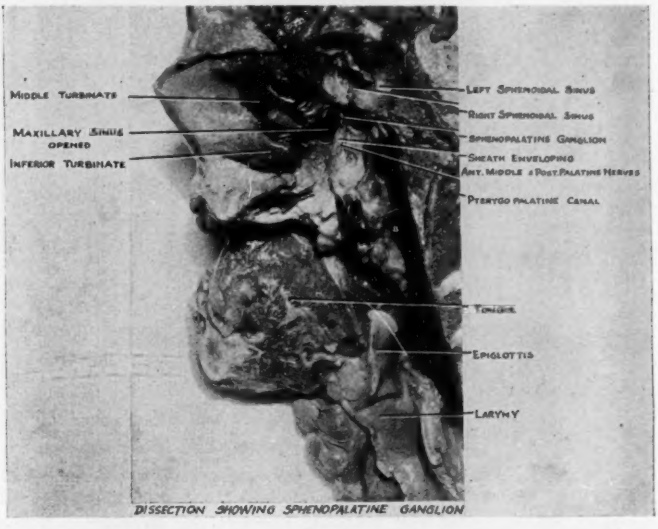
syndrome, a sympathetic syndrome and a local sphenopalatine ganglion syndrome coming from the cells located in the ganglion proper. Usually combinations of the above syndromes occur.

In considering the symptomatology of sphenoid, ethmoid and antrum disease one often enough finds all three, giving the same symptomatology, thus making unreliable a diagnosis based on symptoms. It is now obvious that all three will produce their symptoms through the same ganglion and thus give clinically the same picture.

For surgical purposes we can consider the ganglion as a sensory unit supplying to a large extent the sensation of the nose, the sinuses,

the roof of the mouth, tonsils and part of the pharynx. Near it lies the maxillary nerve and both can be reached by the same injection. The two together supply the integument of the cheek, the fore part of the temple, the lower eyelid, the side of the nose and upper lips, the lining membrane of the nose, the mucous membrane of the upper part of the pharynx, of the antrum and the posterior ethmoidal cells; the soft palate, tonsil and uvula and the glandular and mucous structure of the roof of the mouth.

The surgical importance of this center has hitherto received very little emphasis. About one year ago, an article by Silverman, the dental surgeon, printed in the *A. M. A.* caused me to begin a study

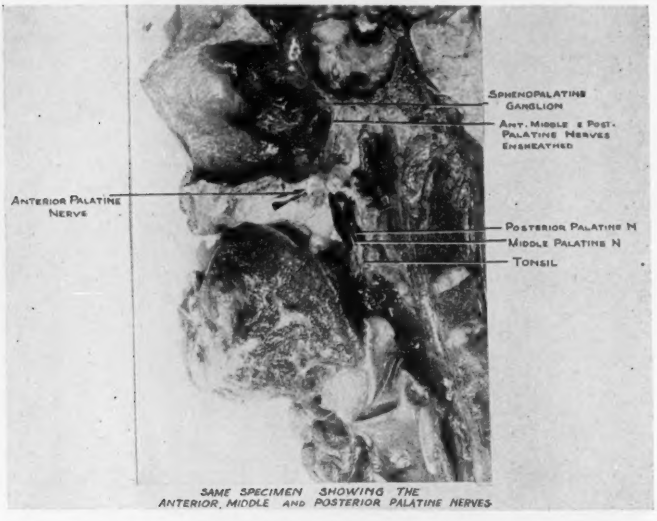


DISSECTION SHOWING SPHENOPALATINE GANGLION

of the sphenopalatine ganglion in connection with the research program of Dr. Imperatori's clinic at the New York Post-Graduate Hospital. Silverman described the injection of the maxillary nerve through the posterior palatine canal. It occurred to me that the sphenopalatine ganglion could be reached by the same route. Since that time I have used sphenopalatine ganglion anesthesia by this new route for a wide range of work and have found it very satisfactory. It has proven of great value in tonsillectomy where an injection of half a cubic centimeter of 1 per cent novocain into each ganglion supplemented by 1 c.c.m. at each base of the tonsil for the glossopharyngeal plexus has given total anesthesia. A very desirable effect

is the diminution of the after pains. The post-operative edema is less and the patient feels more comfortable than by the usual pillar infiltration. Although block anesthesia of the middle and posterior palatine nerves at their emergence from the accessory palatine canal has been practiced, nevertheless I have been unable to find reference to the use of the ganglion injection directly for anesthesia in tonsillectomy.

In radical antrum operations the ganglion injection and the maxillary nerve injection, both performed simultaneously by the new route has given complete anesthesia.



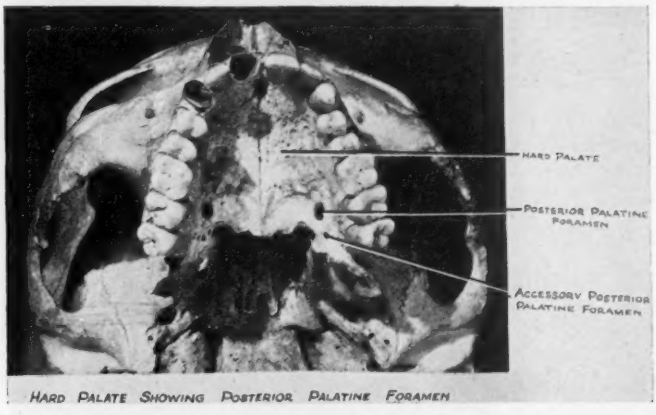
SAME SPECIMEN SHOWING THE ANTERIOR, MIDDLE AND POSTERIOR PALATINE NERVES

For radical ethmoid and sphenoid surgery the ganglion injection has given extensive anesthesia. One must of course remember that the anterior and posterior ethmoidal nerves are not affected by the ganglion injection.

For the submucous resection of the nasal septum the usual block anesthesia is more direct except in cases where the deflection is so great as to make the posterior part inaccessible. Here ganglion anesthesia is excellent.

The technique of the injection is very simple after the regional anatomy has been mastered. The sphenopalatine ganglion is usually described as situated in the sphenomaxillary fossa midway between the anterior border of the sphenoid bone and the posterior border of

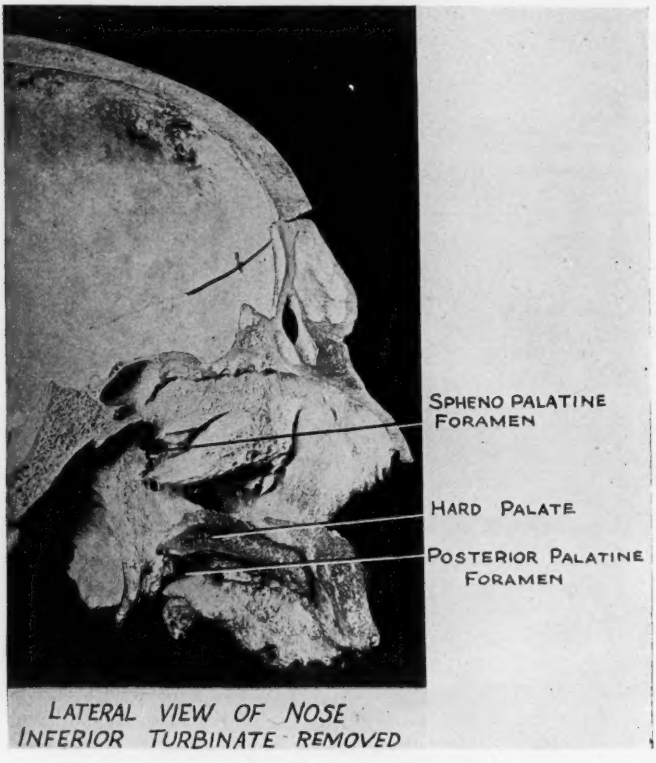
the maxillary bone and 5 to 6 m.m. beneath the second division of the fifth nerve as it bridges the ptergopalatine fossa. In dissections I have found the ganglion to lie rather close to the sphenoid, separated from the periosteum by a thin layer of fascia. The ganglion is hung a few millimeters below the maxillary nerve and appears to be slung between the maxillary nerve laterally and the Vidian nerve medially. Anterior to the ganglion is the fairly large sphenopalatine artery and a sheath of fascia surrounding it. The fascia surrounding the ganglion is quite distinct and can be seen extending down into the posterior palatine canal to about the level of the inferior turbinate. Laterally the fascia encircles the maxillary nerve, forming a sort of diaphragm around it. The fascia then extends up around the sphenoid fissure to envelope the retro orbital tissues. Thus



HARD PALATE SHOWING POSTERIOR PALATINE FORAMEN

fluid injected into the ganglion region can diffuse up to the retro orbital structures, causing a temporary amblyopia or transient abducent paralysis. The ganglion lies in close proximity to the sphenopalatine foramen. Above, the ganglion is covered by the under surface of the sphenoid and orbital process of the palate bone, behind by the ptergoid process and greater wings of the sphenoid, anteriorly by the maxillary sinus, and laterally, and inferiorly by the sphenomaxillary fossa. As Sluder points out, we must consider the ganglion, not as surrounded by the various bones, but rather by the sphenoid, ethmoid and maxillary sinuses. The walls of these sinuses in relation to the ganglion are sometimes as thin as egg shell, and under these circumstances, the ganglion is exposed to the effects of diseased conditions of the paranasal sinuses. The anatomical varia-

tions of the sinuses may also alter the above described relationship. The sphenoid sinus may thus bound the upper and posterior part of the ganglion, or an ethmoidal cell may extend down anteriorly. The nasal ganglion sometimes lies close in the opening of the Vidian canal. Anterior to the ganglion, imbedded in a mass of fat and connective tissue, lie the branches of the internal maxillary artery, the sphenopalatine artery proceeding medially to

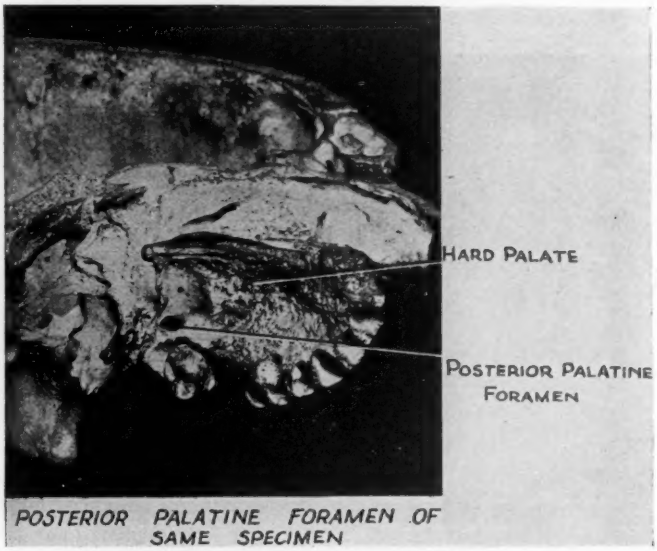


LATERAL VIEW OF NOSE
INFERIOR TURBINATE REMOVED

the sphenopalatine foramen and then to the lateral wall of the nose, the palatine artery descending into the posterior palatine canal along with the palatine nerves.

Injection of the sphenopalatine ganglion can be practiced through three routes; laterally by way of the sphenomaxillary fossa, generally employed by the dentists; medially through the lateral wall of

the nose by way of the sphenopalatine foramen, as suggested by Sluder; and inferiorly through the roof of the mouth by way of the posterior palatine canal, as we suggest. The last route is the only one that is in constant relationship to the ganglion and is independent of any intranasal condition. In utilizing the posterior palatine canal one is guided as in a grooved director along the large palatine branch of the ganglion upwards directly to the ganglion in almost a vertical line. The technique of the ptergopalatine or posterior palatine injection as it is most conveniently called, is very simple. A glance at the illustration of the roof of the mouth shows the posterior palatine foramen. Through this foramen one enters directly the posterior

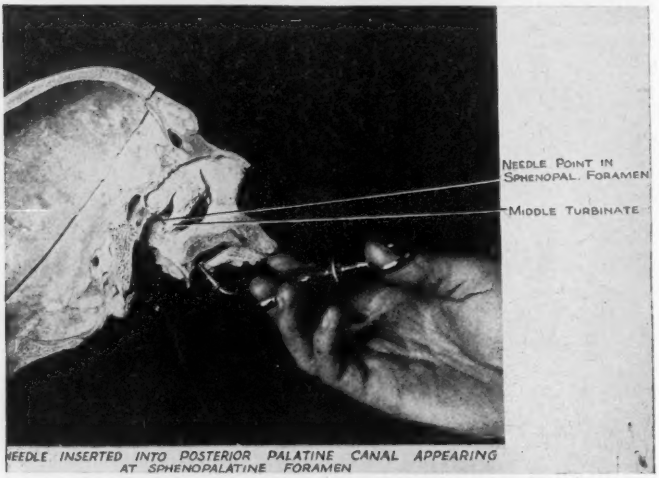


POSTERIOR PALATINE FORAMEN OF SAME SPECIMEN

palatine canal. The lateral aspect of the palatine bone shows a deep groove on its posterior portion, descending from the level of the sphenopalatine foramen. This deep groove is converted into the ptergopalatine canal by articulation with the maxillary bone. The illustration of the palatine bone shows the canal and the ptergopalatine fossa where the ganglion is located.

For the injection of the ganglion I employ a 22 gauge platinum needle, 45 m.m. long, mounted on a syringe at about a 45° angle. With the patient in the lying position and head extended, the canal, which is almost vertical in the sitting position, is brought into a

plane 45° to the horizontal. In this position I have found injection easiest, although it can also be done in the sitting position. To enter the canal one first locates the posterior palatine foramen. This opening is usually round, quite large and as seen from the illustration lies opposite the second molar tooth. Palpate the edge of the hard palate and insert the needle 5 m.m. anteriorly and about .75 c.m. medial to the second molar tooth. In edentulous mouths one is of course guided more by palpation of the hard palate. In these cases, however, the posterior palatine foramen is large, thus making it relatively easy. The posterior palatine foramen varies in its position. Sometimes it is opposite the last molar tooth or it may be oval in shape and quite close to the alveolar process. One is therefore obliged occasionally to probe with the needle to locate the opening.

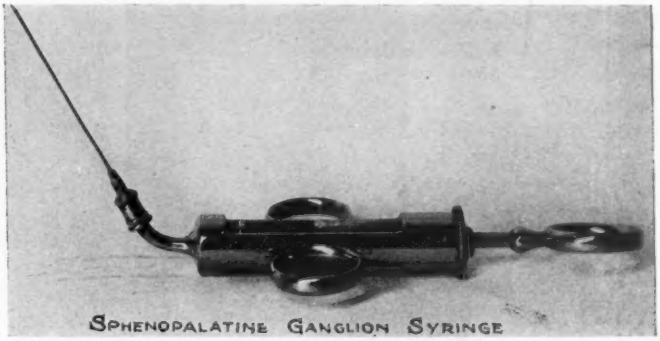


NEEDLE INSERTED INTO POSTERIOR PALATINE CANAL APPEARING AT SPHENOPALATINE FORAMEN

Another guide to the foramen is an occasional dimple in the mucous membrane of the palate in this area. This dimple is sometimes redder or paler than the surrounding membrane. If one goes behind the posterior edge of the hard palate the needle slides in easily, but instead of being in the canal it has merely perforated through the soft palate and the fluid runs into the pharynx or appears mixed with blood in the nose. If the needle was placed through the soft palate more laterally it will slide along under the mucous membrane of the lateral wall of the nose and the fluid will be dopsited in the vicinity of the sphenopalatine foramen. In such event anesthesia of the ganglion would occur by infiltration.

The needle is inserted through the posterior palatine foramen into the posterior palatine canal to a depth of 3.5 to 4 c.ms. and will then, as shown in illustration, appear opposite the sphenopalatine foramen and directly in the ganglion. By advancing the needle 5 m.m. deeper the point comes to lie medial to the maxillary nerve, which can then be injected if necessary.

Preparatory to the injection, the patient's mouth is washed with alkalin antiseptic fluid and the roof of the mouth in the neighborhood of the site is painted with half strength solution of iodin. For anesthesia 1 per cent novocain with adrenalin is used. For alcoholic injection the posterior palatine canal is first located with novocain then followed with the alcohol. The patient should be warned against closing his mouth or a mouth gag can be used. Leverage on the needle must be avoided and at least .5 c.m. of the needle should re-



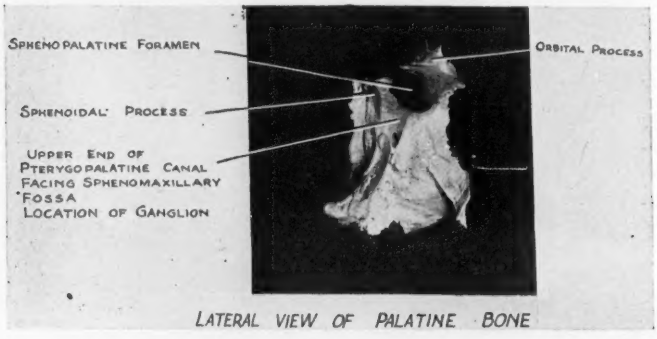
SPHENOPALATINE GANGLION SYRINGE

main outside of the palate to avoid any difficulties in extracting the needle should it break at the hilt. This accident is not more possible here than in injections elsewhere. Like all technical procedures, simple as it is, it nevertheless requires a certain amount of practice and skill.

The medical aspects of the sphenopalatine ganglion have been splendidly worked up by Sluder. By injection one can easily and dramatically stop pain in remote regions that have not yielded to the effects of narcotics. It is almost unbelievable that the pain of a sciatica that has resisted almost every form of treatment should yield within a few minutes to a local application of cocain in the nose, yet such has been my experience. Dr. Hiram Byrd reports a series of 47 similar cases, including 5 cases of sciatica and several of arthritic pains. A list of the conditions that have proven amenable to

treatment through the ganglion are as follows. The first fifteen listed were recently review by Sluder.

External cricoidynia; lower jaw toothache; glossodynia; earache in case of Eustachian tube and middle ear lesions; earache secondary to cancer of the larynx; the pain of laryngeal tuberculosis; the pain of herpes of the shoulder; relief of spasm of the esophagus; relief of spasm of the face and upper respiratory tract; all syphilitic headache; malarial headache; ophthalmic migraine; dysmenorrhea; lumbago; intercostal pain (neuralgia); gastric pain; nausea and diarrhea; myalgias of the neck muscles; sciatica; maxillary neuralgia; tic doloreaux; sensory facial neuralgia; pain in the upper teeth and sensation as though teeth were too long; feeling of foreign body in the throat; persistent itching in the external canal; herpes zoster oticus; taste disturbances.



LATERAL VIEW OF PALATINE BONE

Long as the list appears to be, there are no doubt more conditions that will prove themselves amenable to treatment through the ganglion. One almost feels as though in the nasal ganglion we have a pain center. On the other hand, the sphenopalatine ganglion marks practically the upper end of the sympathetic nervous system. Fibres in the sympathetic chain are known to extend fairly long distances through several ganglia. It is thus possible that the sphenopalatine ganglion exerts an influence for a considerable distance along the sympathetic chain.

The cases as previously suggested group themselves under four headings: 1, sphenopalatine maxillary neuralgia; *2*, sphenopalatine facial neuralgia; *3*, sphenopalatine sympathetic neuralgia; *4*, sphenopalatine ganglion cell neuralgia. The following cases illustrate examples of each. The typical cases involving most of the ganglion symptoms are fairly common and need no special consideration. I am

therefore giving only one example. The other cases described represent unusual pictures found in sphenopalatine ganglion disorders.

Miss L. D., age 28 years, teacher, referred to me by Dr. Julius Miller. At age of ten. following an attack of tonsillitis began getting headaches, which have continued intermittently to the present time, becoming progressively more severe. Her headache would begin in her left eye, spread to her left frontal region, then in the course of the day would go to the side of her head, mastoid and occipital regions, then into the neck and shoulder of the same side. The attacks would recurr about every two to four weeks and last about three to five days, during which time she would be practically incapacitated. Severe attacks would be associated with nausea and occasionally vomiting. Because of the cyclic character of the attacks she was given all sorts of glandular therapy and emmenogogues.

Examination during an attack revealed a ptosis of the left eyelid and slight dilatation of the pupil. There was a suggestion of flattening of the face on the left side. Nasal examination revealed a hypertrophied left middle turbinate and deflected septum. There was no post-nasal discharge. Throat and larynx negative. Cocainization of the sphenopalatine ganglion region stopped the entire attack in a few minutes. The headache disappeared, the ptosis of the left eyelid cleared, and the patient said that the eye felt much clearer. After several treatments the attacks became milder and less frequent. At present she is still subject to slight temporal headache occurring once about every four or five months and lasting only several hours.

This case is typical of the sphenopalatine ganglion 7th nerve type and shows its distribution in the area of the facial nerve branches. In addition there is apparent involvement of the 3rd nerve through the ciliary ganglion or sympathetic stimulation to the dilators of the pupils.

The maxillary type is illustrated by the following case: B. R., a young lady, referred to me by Dr. H. Handelman, who for the last two years has had pains in both maxillary regions and extending down into her mouth, particularly her upper gums. She also suffered from frequent attacks of frontal headache and pain deep in the eye. She has had rhinorrhea as far back as she could remember. After considerable treatment by various practitioners she finally decided to take matters into her own hands, so in spite of negative X-ray reports of the teeth and sinuses, insisted that her dentist remove two of her upper teeth. She got no relief and her condition grew gradually worse. Dr. Handelman diagnosed the condition and referred the patient to me for treatment. The application of 20 per cent cocain

to the ganglion immediately relieved her of the entire pain and following several treatments it cleared up entirely.

The sympathetic syndrome is well illustrated by the case of Mrs. S. W., age 59 years. For the last two years the patient has had a profuse watery discharge, so profuse that during the day she would continously wet handkerchiefs. At night she was obliged to wake up every few minutes to get rid of the secretion flowing down her throat. Associated with this was the complaint of fullness in the ears, tinnitis, pain in the muscles of the neck and shoulders, with the formation of painful nodes in the neck muscles. These nodes would appear most frequently as large lumps in the supra-clavicular regions, were painful and disappeared in a few hours. The patient also suffered from severe attacks of asthma, palpitation and nausea.

Nasal examination revealed a deflected septum, stenosis of the right middle meatus and bilateral ethmoiditis.

The entire syndrome was partially relieved by the application of 10 per cent silver nitrate to the ganglions. Following this I injected both ganglia by the new route. In five minutes she got a very severe attack of asthma and complained of severe headache, pains in both cheeks and the root of the nose. That night there was only slight discharge from the nose and in the morning the patient complained rather of dryness in the nose and throat. For two weeks she was in excellent condition, nose and throat practically normal. She then relapsed but did not suffer as badly as she did before injection. This case will no doubt need repeated injections.

Tic doloreux in one of our cases yielded remarkably to injection of the sphenopalatine ganglion and maxillary nerve through the posterior palatine canal route. This route has a distinct advantage over the nasal injection in that one can get a thorough injection of the maxillary nerve at the same time. Tic doloreux appears to be a combination of maxillary and sensory 7th nerve neuralgia with irritation of the motor facial fibres. At the sphenopalatine ganglion the greater superficial petrosal of the facial comes into relationship with the maxillary division of the trigeminal. I therefore assumed that this region was the likely source of the disturbance and proceeded to anesthetize the ganglion by local application in the nose. The relief, though incomplete, was instantaneous. I then injected the ganglion and maxillary nerves by the new route with 70 per cent alcohol and completely relieved the patient. The case was that of a woman age 64 years, referred to me by Dr. N. Gordon. She suffered for four months with severe spasms of Tic doloreux. The attacks would occur every few minutes and be induced by eating,

talking or the slightest exposure to cold. The patient was in severe agony in spite of the constant use of morphin. After two weeks' stay in a neurological institution a resection of the gasserian ganglion was suggested. She refused to permit operation and left the institution. It is now five months since the injection and she has had no recurrence whatsoever. This patient was demonstrated at the New York Clinical Society.

Another very interesting condition which ganglion treatment has been able to relieve is persistent itching of the external auditory canal. This occurred in a physician, one of my students at the New York Post-Graduate Hospital. The case is that of Dr. A. B. L., of Kingston, Ont. For the last six years he had suffered from severe attacks of itching in the ears, especially when using the stethoscope. The itching would be so severe as to awaken him sometimes at night and his scratching would lead to the frequent formation of furuncles. There were no typical headaches or neuralgias. Nasal examination revealed a chronic bilateral ethmoiditis with polypi in both middle meati. He had badly diseased tonsils. The treatment of both ganglia stopped the itching completely. He received two treatments and has had complete relief since.

Treatment of sphenopalatine ganglion has proven valuable in the relief of a feeling of the presence of a foreign body in the throat. This complaint is generally associated with signs of sensory disturbances elsewhere in the throat, such as a burning or stinging of one-half of the roof of the mouth or gums. The complaint is usually unilateral. These cases occur in persons around the age of 40 and 50. Usually they are diagnosed as hysteria or climacteric disturbance. The case of Mrs. H. age 40 years, is illustrative. She complained of a sensation of the presence of a foreign body in the throat and a scratchy feeling extending down into the chest along the sternum. She had an unproductive cough and some heaviness in breathing. During the summer she had frequent attacks of otalgia and cervical neuralgia. Examination revealed many carious teeth and diseased tonsils. The application of cocain to the ganglion immediately relieved her of the entire complaint. After several treatments she was considerably improved.

It appears that diseased tonsils, teeth, infected sinuses and mucous membrane lesions of the nose, throat and larynx have sensory connection with the sphenopalatine ganglion and give rise to their symptomatology through the various manifestations of the nasal ganglion.

Shortly after completing this article, a silk merchant, J. K., age 63 years, referred to me by Dr. N. Gordon, came to me complaining

of a bad taste in the mouth for the last twenty-one months. This bad taste, which at first was salty and now is rather bitter, is limited chiefly to the left side. This complaint is so severe as to cause the patient to awaken several times during the night to rinse his mouth. Occasionally he also has pains in the left maxillary region. He suffers also from attacks of dizziness and nausea. Examination revealed a bilateral ethmoiditis most marked on the left side. Cocainization of the sphenopalatine ganglion with 40 per cent solution gave immediate relief and after three treatments he felt considerably better. This type of case has rarely been diagnosed as of ganglion origin. My attention was called to this phenomena by one of the untoward results that followed a ganglion injection. The patient was injected for hay-fever associated with chronic ethmoiditis. For a few weeks after the injection she complained of loss of taste on the injected side. In tracing the possible cause I found that the sensory root of the facial, also called the Nervus Intermedius of Wrisberg, possesses taste fibres, some of which probably travel through the greater superficial petrosal to the sphenopalatine ganglion to be distributed through the palatine nerves to the roof of the mouth.

In conclusion, I wish to point out that we can consider the sphenopalatine ganglion neuralgia as a combination of four syndromes: *1*, sensory facial (7th nerve) syndrome; *2*, maxillary (5th nerve) syndrome; *3*, sympathetic syndrome; *4*, sphenopalatine ganglion cell syndrome.

These may occur singly or in combination. The sphenopalatine ganglion is one of the chief centers of nerve supply for the nose and sinuses and by anesthetizing it one can secure extensive anesthesia. The sphenopalatine ganglion can be readily approached for injection through the posterior palatine canal.

I wish to express my thanks to Dr. Imperatori for his hearty encouragement in this work.

351 West 86th Street.

OBSERVATIONS IN BONE-CONDUCTION AND A DIFERENTIAL TEST FOR STAPES FIXATION.*

DR. EUGENE RICHARDS LEWIS, Los Angeles, Cal.

In attempting to reach some conclusions concerning the testing of bone-conduction. I have been making use routinely of a number of observations. I am not at all sure that any of these procedures are new and my only purpose in applying them in a routine way in my clinical and private examinations was to make definite records for comparison, in the hope that something of value might result. So far the observations concerning lateralization testing have brought forth nothing worthy of report, but an interesting fact seems to have developed from the records of the monolateral bone-conduction testing. From my present findings in many hundreds of tests, I am inclined to believe that it is possible to differentiate between fixation of the stapes footplate and conduction-obstruction of other nature by the use of a very simple observation. It may be that this observation has been recorded before but I have found no mention of it.

The vibrating fork held on the root of the zygoma—just at the glenoid—is heard normally almost as loud and as long as it is when placed over the auditus-antrum area of the mastoid. When it is held on the tragus it is heard normally louder and longer than when it is on the zygoma-root. When the canal or tympanic cavity is the site of a simple obstructive lesion, the same relation continues to exist —namely, the fork is heard louder and longer on the tragus than on the zygoma-root. Cases of nerve-deafness also show this same relation between the hearing on the zygoma-root and the tragus—namely, the fork is heard louder and longer on the tragus than on the zygoma-root. When this test is made on cases of known fixation of the footplate of the stapes, this relation is reversed. The fork on the zygoma-root is heard long after it ceases to be heard on the tragus; while it *is* heard on the tragus, it is heard much louder on the zygoma-root.

This differentiation seems consistent with accepted conceptions of the physics of the hearing apparatus. With the fork on the bone, the vibrations are transmitted directly by bone in all directions; when the perilymph of the scala is encountered by the vibrations they are transmitted *normally* by the perilymph in such a manner as to effect interaction between the hairs of Corti and the tectorial membrane. With both round window and oval window closed, conceiving the membranous labyrinth as completely surrounded by unyielding tis-

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sue, transmission of vibrations in such a manner as to result in interaction of hairs and tectorial membrane would be theoretically impossible; but as long as either or both windows are not so closed, the contained fluid finds a venting which permits the production of the interaction necessary to stimulation of Corti's cells. In case of fixation of the stapes footplate, sound-waves conducted directly via the bone have no difficulty in stimulating Corti's cells, because of the venting at the round window; but sound-waves from the tragus produce almost no stimulation of Corti's cells, owing to the peculiar conditions encountered in the conduction mechanism of the tympanum. They might find access through the internal membrana tympani, but as the same membrane must act as the vent for the waves passing through it to the perilymph, its efficiency in acting thus as a transmitter is greatly lowered. This results in the marked inferiority of the tragus route as compared with the bone route for vibrations in these cases.

The test is very quickly carried out, using either a vibrating fork between 96 and 256 d.v. or the audiometer with bone-conduction sound-piece.

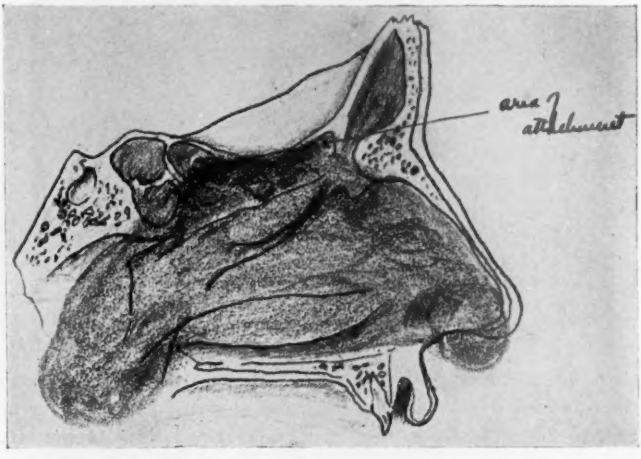
In carrying out the Weber test, I have been making use routinely of our points in the midline of the skull—the occiput, the vertex, the glabella and the jaw symphysis. While so far I have not encountered any striking developments with respect to lateralization, I have become convinced that the use of this four-point observation offers less probability of error in drawing deductions concerning lateralization than the use of any one point in the midline.

I have also been using routinely a simple procedure in conjunction with both the Weber and the Rinne tests which seems to me to be of distinct value. By obturating the external canals during these tests one can gain additional data concerning obstructions or lack of obstruction of the tympanic apparatus. A questionable lateralization of the Weber test may be converted to a pronounced lateralization by obturating the canal of the same side, or it may fail to be altered by such alteration. During the Rinne test, obturation of the canal may by obturating the canal of the opposite side, or this may fail to cause such alteration. During the Rinne test. obturation of the canal may convert a doubtful negative, or it may not change its doubtful character; on the other hand, it may reverse a positive. In any event, I have found the additional data derived from this procedure to be very welcome, and in many cases distinctly helpful in reaching a more ample diagnosis.

REPORT OF A CASE OF NASAL FIBROMA OF UNUSUAL EXTENT.

Dr. L. DeV. Chipman, St. John, N. B.

History: Four years ago patient noticed tearing of right eye. This was followed by difficult nasal breathing and later by complete nasal obstruction. He was seen by several specialists and intranasal operations performed, but no permanent relief obtained. The condition became progressively worse, mouth breathing also becoming obstructed, so that for the last two years he has not been able to breathe freely with his pharyngeal muscles relaxed, and for the last year, in



order to breathe, he has had to make a pronounced effort with his pharyngeal muscles to raise the mass in his throat, which apparently obstructs the larynx. Restful sleep has been impossible. About six months ago the nose became definitely enlarged and widened at the bridge.

Present condition: Patient is a boy, age 18 years. General appearance suggests one in the last stages of a malignant disease, with wasting and cachexia very pronounced. A red fibrous looking mass projects from the right nostril, and by pressure, entirely occludes both

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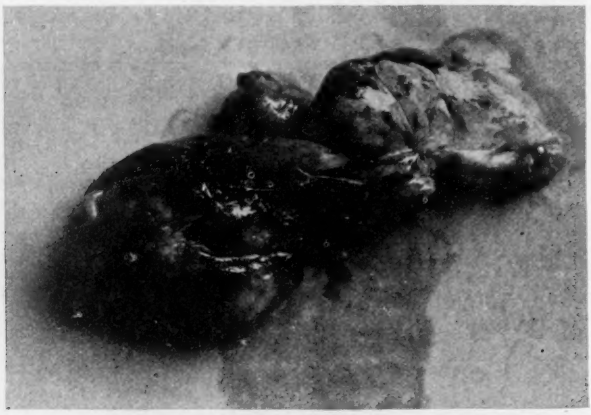
nostrils, also displacing the lateral walls of the nose. The pharynx is filled with a fibrous mass about the size of a child's fist, pendent from the posterior nares, and pushing the palate forward. When patient relaxes, the growth sinks down into the throat to about the level of the larynx, preventing breathing.

During sleep there is a period of relaxation followed by semi-strangulation, then a spasm of the pharyngeal muscles, a breath, and again relaxation, the picture being one of a drowning man fighting for breath.

Operation: Light ether anesthesia was induced, but as patient soon suffered from profound shock very little anesthesia was needed.

The pharyngeal mass was grasped with tenaculum forceps and pulled forcibly upward, the soft palate divided to the alveolar ridge



and the bony palate cut away. The mass thus exposed was found to be continuous from the nostril to the pharynx. It was very adherent to the roof of the nose throughout the ethmoid region. All the nasal structures were distorted and atrophic from pressure. Great difficulty was experienced in getting any line of separation, but finally with the alternate use of a Hurd tonsil dissector, and scalpel, combined with finger dissection, the entire mass was removed. The repair of the palate was easily made on account of the relaxation, and a perfect result obtained.

Except for shock symptoms the patient made an uneventful recovery, and when last heard from, one year after operation, he was in good health and had gained greatly in weight and strength.

42 Coburg Street.

LYMPHANGIOMA OF THE PHARYNX AND LARYNX.*

DR. ARTHUR J. HUEY, New York, N. Y.

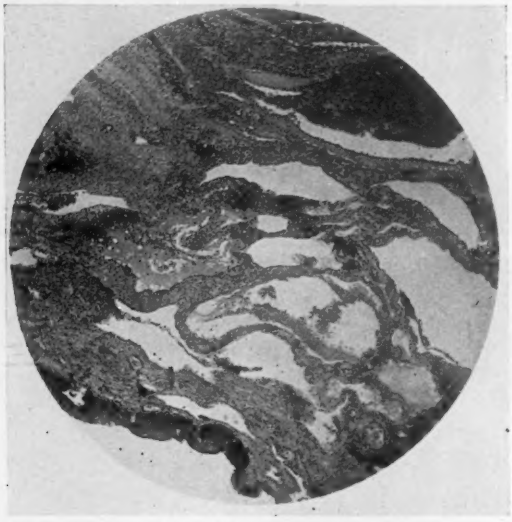
J. G., twenty-two years old; born in Cuba.

Family History: Negative.

Ven. History: Wassermann negative.

Past History: No previous diseases.

Present History: At the age of six years noticed a growth on the posterior wall of the pharynx. This slowly increased in size without much discomfort to the patient until October, 1923, when he began to have difficulty in swallowing, and obstruction to breathing.

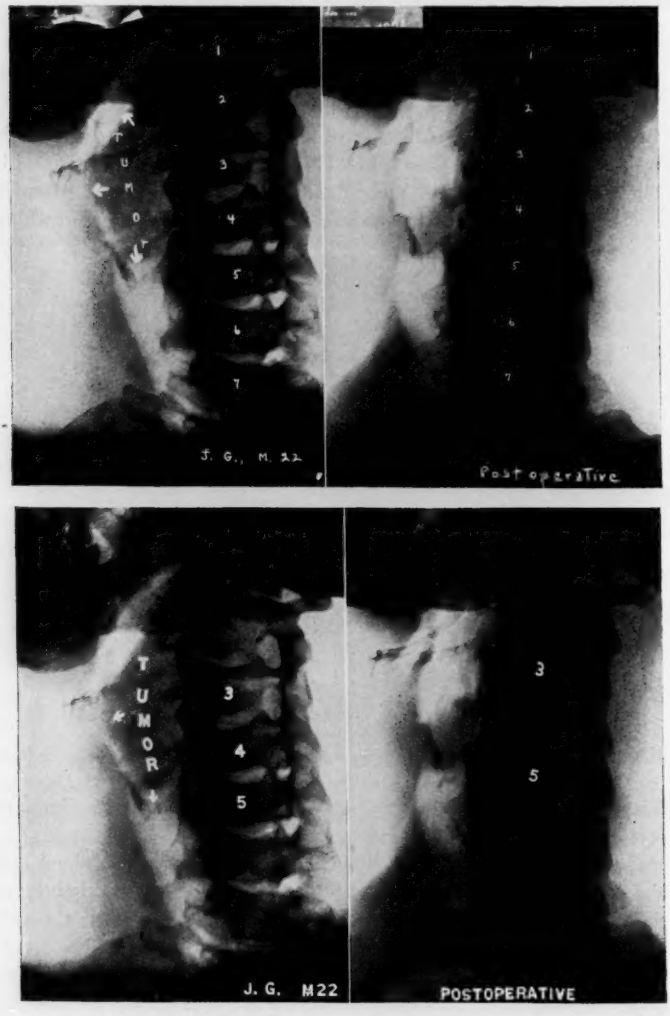


There was no pain. The loss of weight from October to January was considerable.

Examination: January 1, 1924. The patient was examined and showed a tumor on the posterior wall of the pharynx slightly to the right of the median line from the level of the edge of the soft palate downward into the larynx. The size was that of a hen's egg. The consistency was soft but not friable. The color was pale bluish gray. There was a small tumor of similar appearance the size of a grape situated slightly to the left of the larger growth.

*Read at the Section on Laryngology and Rhinology, New York Academy of Medicine, May 28, 1924.

Laryngeal examination was impossible. A radiograph showed the growth to extend to within an inch of the vocal cords. The lower end was somewhat pedunculated.



The patient was moderately emaciated. The expression was anxious, voice was thick but resonant. Blood count, Wassermann and urinalysis were all normal.

On January 8, I removed the smaller growth with a snare and sent it to the laboratory with a tentative report that the tissue was probably that of a mucous polyp. On January 15, an attempt was made to snare the larger growth. I was unsuccessful as it was impossible to get the wire over the whole tumor down to the base and the tumor itself was too resistant to cut with the snare. After breaking a loop of No. 9 wire repeatedly I was obliged to abandon the attempt.

That night the growth became red and swollen from the traumatism to such an extent that breathing was extremely difficult. A tracheotomy was done the following day to relieve the dyspnea and to allow an anesthetic to be given for the removal of the tumor, which was accomplished by direct laryngoscopy the mass being dissected away from its attachment with scissors and finger. There was very little hemorrhage. The tube was removed from the trachea the next day and the patient made a rapid recovery.

The specimen measured 7 c.m. in length by 3 c.m. in breadth, and weighed 35.3 grms. The pathological report was lymphangioma. There was considerable blood in the lymph spaces due to traumatism during the attempt at removal. Subsequent study of the small tumor first removed showed the tissue to be of the same character.

580 Park Avenue.

GIANT-CELL SARCOMA OF THE SUPERIOR MAXILLA.

DR. J. A. MORGAN, Honolulu, T. H.

The most common giant-cell sarcomata are those which grow from the alveolar process of the jaw and hang as pedunculated tumors in the oral cavity. The growths which are known by the name of epulis are covered for a time with the mucous membrane of the mouth, but tend to become ulcerated. They usually are small, but occasionally reach such size as to practically fill the mouth. When removed they show but little tendency to recur and there are no metastases.

Although large irregular protoplasmic masses with several large nuclei occur at times in many of the mixed cell sarcomata, there is a group of tumors in which typical multinucleated giant-cells form so

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constant a feature that they are classed by themselves under this name.

They arise usually in connection with bone and although many of them are other wise composed of spindle-shaped cells showing no tendency to cartilage or bone formation, there are also tumors containing such giant-cells which belong definitely to the group of osteosarcomata.

For this reason it has been suggested that the giant-cells may be identical with the osteoclasts of the bone which are endosteal or periosteal cells modified by their phagocytic function. Others have thought that since giant-cell sarcomata occur also in other places, such as the breast, far from any connection of bone, the giant cells

might be regarded as comparable to the ordinary foreign body giant-cells.

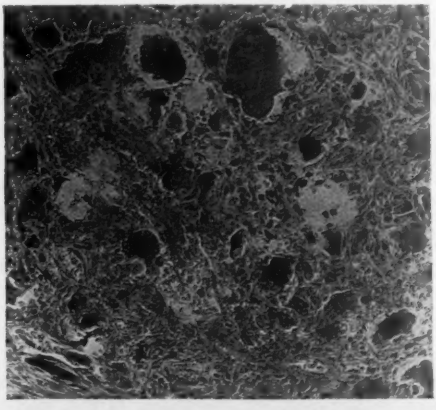
There are perhaps two fundamental differences between the giant-cell character of the osteoclasts and that of foreign body giant-cells, in both cases it seems to be a morphological modification dependent upon the function of the cells and perhaps only temporary. It is, therefore difficult to decide upon the relation of the cells of the tumor to giant-cells and probably dangerous to assume that any of these types of giant-cells could transmit their giant-cell character to their offspring. (McCallum.)

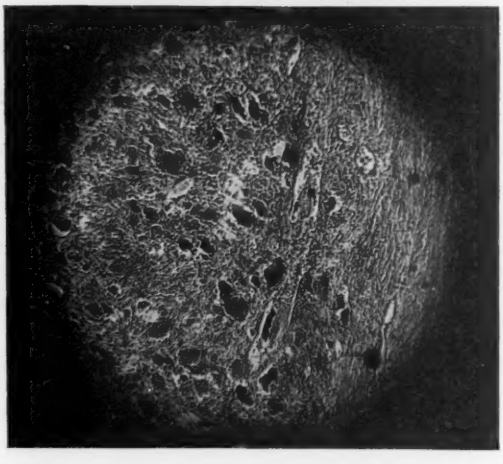
Mrs. T. B., Portuguese, age 19 years. Had the usual diseases of childhood. General health good.

At about the sixth month of pregnancy, patient noticed that there was a swelling on the upper jaw just under the upper lip. From

that time on to the completion of pregnancy the swelling continued to grow. After this had continued about four months the right canine and incisor teeth became painful and quite loose.

At operation the tumor mass about the size of pigeon's egg was found to be occupying the canine fossa and extending upward into





the floor of the maxillary sinus. At the lower pole of the tumor the canine and second incisor teeth were undermined and practically displaced from their sockets, therefore they were removed. The tumor mass was firmly adherent to the periosteum of the alveolar process and also had extended upward into the floor of the antrum of High-

more. The mucosa of the sinus was ulcerated and considerable pus formation had taken place in the sinus cavity. The maxillary sinus was drained and an opening made into the inferior nasal meatus. The patient made an uneventful recovery from the operation.

The tumor was of firm consistency and macroscopically had the appearance of a fibroma with small cranberry-like areas scattered through it. Microscopic section showed one layer of muscle cells, beneath which there was a layer of fibrous tissue surrounding a solid mass of tumor tissue. The tumor tissue showed a loose structure infiltrated with red blood cells and scattered evenly throughout there was a large number of giant-cells. The frame-work of the tumor mass is made up of loosely growing fibroblasts.

Although the laboratory diagnosis was giant-cell sarcoma it was thought advisable to give X-ray treatment. Once in three weeks an eight minute application of X-ray, 9 in. S. P. G. 13 M. A. 4 M. M. filter, 10 in. distance, was given to the former site of the tumor with no local reaction. After a period of six months there has been no sign of recurrence.

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Room 48, Young Bldg.

OBSTRUCTION OF A MAIN BRONCHUS WITH REPORT OF AN UNUSUAL CASE.

Dr. Chester Bowers, Los Angeles.

The causes of obstruction of a main bronchus are variable, and it seems worth while to assemble the different etiologic factors in determining the diagnosis of a rather unusual case. Before proceeding with the causes it might be well to review the anatomy and particularly the structures in relation to the bronchi.

The trachea bifurcates at the level of the upper margin of the fifth dorsal vertebra; on the chest it is marked by the junction between the manubrium and the body of the sternum. The right bronchus is one inch long, is larger in diameter, shorter and more vertical. Structures in relation to it, are—the vena azygos major arching over it from behind on its way to the superior vena cava and the right branch of the pulmonary artery lies below and in front of it. It can hardly happen that either of these vessels give rise to obstruction of the right bronchus. The left bronchus is two inches in length and is smaller in diameter and more horizontal in direction than the right. It is in relation with a number of important structures, that may cause obstruction of its lumen if they are themselves diseased. The important ones are—the arch of the aorta which starts in front of the left bronchus, crosses over it obliquely and passes down behind it as the descending aorta. The esophagus and thoracic duct lie behind the left bronchus. The left branch of the pulmonary artery lies at first above and then in front of it, and the left auricle and auricular appendix lie below it, within the pericardium. It is clear that the left bronchus is subject to compression and obstruction by the growth of such things as aneurysm of the arch, cancer of the esophagus or by the enlargement of the left auricular appendix.

Anomalies of the tracheo-bronchial tree are rare. Kahler reports two cases of diverticula of the tracheo-bronchial tree, consisting of rudimentary bronchial branches. Guisez reports a congenital valve-like web obstructing part of the trachea. Sankott reports a case of congenital narrowing of the trachea in which the membranous part of the rings were deficient and the rings were completely closed. The diameter in this case was narrowed to

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8 m.m. as contrasted with a normal of 20 to 27 m.m. Comparative anatomy shows closed rings are common to a majority of birds and some reptiles. Congenital Esophago-bronchial and Esophago-tracheal fistula have been reported.

The next matter to be considered is the variety of methods in which a main bronchus could be obstructed. These may be divided into the external causes producing compression, and the internal causes producing obstruction.

By far the most frequent of the external causes are aneurysm of the aorta, usually of the arch or descending aorta, rarely by the pressure of a much dilated left auricle in mitral disease. G. W. Pitt, in analyzing one hundred and forty cases of aneurysm of the aorta, found that thirty compressed the left bronchus, sixteen eroded into it, five compressed the right but none eroded into it. Jackson states that hypertrophy of the left auricle due to mitral stenosis is not infrequent.

Malignancy occurs as malignant disease of the esophagus which ultimately invades a bronchus and malignancy of the bronchial glands or mediastinum. Primary malignant disease of the main bronchi is far more frequent than is commonly supposed. Carl Weller, in 1913, reported a review of three hundred and seventy-four cases, and with analysis of eighty-nine cases which were verified by autopsy. Eighty-seven per cent of neoplasms of the lung and bronchi are of bronchial origin. They are most frequent between the ages of fifty-five and sixty, although two cases have been reported at seventeen and eighteen years respectively. The growth originates usually in the main bronchus just below the bifurcation. Carcinoma of the bronchi may spring from the bronchial mucosa or from the epithelium of the bronchial mucous glands. Endochondromata springing from the cartilage of the bronchi and sarcoma are of occasional occurrence. Recently Imperatori reported a case of primary Adeno-carcinoma of the bronchus. The growth was identified through the bronchoscope and verified by section. Freudenthal reports the repeated removal of a teratomatous growth in the trachea which recurred several times and finally resulted in the death of the individual. Septic pneumonia, abscess and gangrene are the usual sequellae of malignant disease of the lung.

Compression of a bronchus by a mass of enlarged glands at the bifurcation of the trachea is a factor to be considered in young infants. These glands may break into the bronchus, causing dyspnea and purulent secretion.

The internal causes of bronchial obstruction are:

1. Broncholiths,
2. Congenital Webs,
3. Syphilitic ulceration with scarring,
4. Primary malignant disease of a bronchus,
5. Foreign bodies in the bronchus.

Broncholiths are extremely rare. Syphilis of the trachea and bronchi is usually seen as a localized gummatous infiltration of the mucosa, causing considerable swelling; the gumma may be absorbed and a cicatrix result, or it may break down and an ulcer form with the production of a scar. The disease is often situated at the lower end of the trachea and the bronchi are implicated in one-half of the cases. In an analysis of a hundred and twenty-eight cases of syphilis of the trachea, gummatous swellings appeared in twenty, ulceration in fifty-one, twelve of which perforated, cicatrization in sixty. The result of the cicatrix is a narrowing of the lumen and the star-shaped scar constricting the bronchioles.

Malignant disease of the bronchi has been previously considered so we will now pass on to the consideration of foreign bodies in the bronchus. Of all the factors, this group is by far the most common cause of bronchial obstruction. The inorganic foreign bodies cause very little reaction but because of their shape may act as a ball-valve trapping the air below them and eventually causing lung abscess. The organic foreign bodies, because of their shape and reaction produced, are the worst offenders in causing obstruction of a bronchus.

The symptomatology of an obstruction of a bronchus varies with the completeness of the obstruction. In the complete the lung distal to the obstruction may be reduced in size, due to diminished air or airless and solid from collapse, or the bronchi filled with retained secretion. First mucous, later purulent, followed by secondary inflammatory changes and septic pneumonia. Before the bronchus is completely occluded the lung is over distended, the heart displaced to the opposite side and the diaphragm pushed down. With inspiration, the chest expands, the air is sucked past the obstruction; with expiration the air has greater difficulty in escaping than it had on entering and the lung becomes over-distended, resulting in displacement of the heart and diaphragm. Later the bronchi become filled with secretion, air under pressure is absorbed and the lung becomes solid and airless. Cough, dyspnea, expectoration are common to all cases. In the differential diagnosis the X-ray is of inestimable value. Aneurysm is diagnosed by the X-ray and

physical signs. Malignant disease by the age, cachexia, X-ray, foul expectoration, by the bronchoscope and biopsy.

In syphilis the blood Wassermann plus the hard paroxysmal cough and stridor and bronchoscopic examination. In none of the cases of syphilis was the stenosis sufficient to displace the heart.

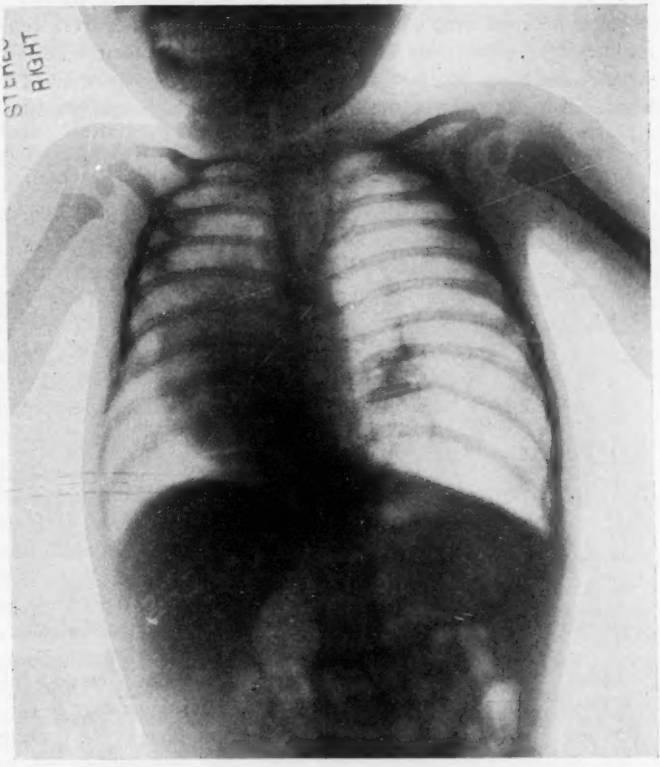
The physical signs of foreign bodies in the bronchi are variable and may even change from day to day. The more constant signs are decreased expansion on the affected side; the asthmatoid wheeze which is absent if the bronchus is completely occluded. Percussion shows impaired resonance, later dullness due to retained secretion. In the case of organic foreign bodies there occurs a reaction to which the term Arachitic Bronchitis has been applied, characterized by edematous and purulent tracheo-bronchitis, high fever, toxiemia and extreme dyspnea; absence of breath and voice if the bronchus is plugged. Willis F. Magnus has summarized the findings in the diagnosis of foreign bodies non-opaque to the X-ray by—

1. Greater transparency over the obstructed side.
2. Depression of the diaphragm on the affected side.
3. Displacement of the heart and mediastinal structures away from the affected side.
4. Limitation of diaphragmatic excursion on the obstructed side.

Case report: F. Y., age 7 months. Referred by Dr. A. J. Scott. Patient is the fourth child; normal spontaneous delivery; has always had rapid respiration, at time of delivery was cyanosed, for several minutes, obstetrician states that he had difficulty in getting the child to breathe and that there was a squeak of inspiration. The parents noted that the child had always breathed rapidly and this was especially marked after exertion. When the child was four months old the mother noticed a swelling on the right side of the sternum, this swelling increased in size up to the present time. Never sick before.

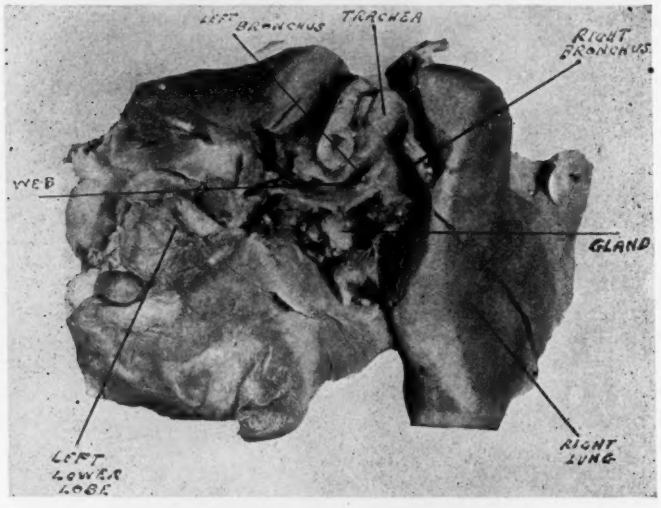
Present illness began six days previously with the symptoms of an ordinary cold with no temperature. Cold was better for three days but on the fourth day he developed a croupy cough, dyspnea but no cyanosis. Dr. Scott called and on examination found a bulging in the right costo chondral region from the fourth to the seventh rib. Color of the child was good except that when he cried, he became cyanotic. The heart was entirely to the right of the sternum; the left chest hyperresonant with distant breath sounds. The right, normal resonance; temperature was normal. Three days after the onset child had a choking spell, wheezed and became cyanosed. Was removed to the hospital. Physical findings were

the same as noted above, except the temperature was 100° rectal. X-ray of the chest—Dr. Henry Snure—shows a marked emphysema of the left side. The left diaphragm is flattened with practically no movement on the screen. Heart and trachea to the right of the median line. No enlargement of the thymus. Pictures two days later showed the same findings except that some secretion appeared in the left bronchus.



Blood count showed 7,000 leucocytes, 68 per cent polymorphonuclears, red count was normal. Two days later child became very much worse, more cyanosed, temperature 100.4° rectal, pulse 168, respiration 64. It was determined that a bronchoscopic examination should be made to determine the cause of the obstruction of the left bronchus. Bronchoscopy without anesthesia, 5 m.m. Jackson tube, thick purulent secretion was aspirated from the

trachea and right bronchus. Bifurcation of the trachea noted but no opening could be seen into the left bronchus, but a thick red membrane pouted into the trachea at this point. As the lesion was apparently a congenital one and the physical condition of the child so poor, the operation was stopped. The child improved after this operation, probably due to the aspiration of the secretion. Five days later was very much worse, had many choking attacks; was badly cyanosed; temperature 103° rectal, pulse 176, respiration 62. Physical findings were much the same except that rales were found on the right side. The left chest was hyperresonant anteriorly, some dullness posteriorly along the spine. Flouroscopy showed the heart still to the right of the sternum and the diaphragm practically



immobile. More secretion in the left lung. Blood count at this time was 27,350 leucocytes, 85 per cent polymorphonuclear.

Another bronchoscopy was done. The membrane at the opening of the left bronchus seemed less thick than previously, and by depressing the carina a small slit appeared superiorly. The bronchoscope was passed into the left bronchus. A large amount of secretion aspirated. No foreign body seen. As soon as the scope passed the web at the entrance of the left bronchus it was noted by the doctor holding the child that air passed into the left lung and that when the scope was taken out none passed in. The child was in such a critical condition that nothing more was attempted and thirty-six hours later the child died.

Autopsy report: There was a bulging on the right side of the third to the seventh rib inclusive at the costo chondral junction. Percussion note over the left chest was hyperresonant. On opening the thoracic cavity the left lower lobe filled the entire right side of the chest and ballooned over into the right side above. The right lung was small but not atelectatic. The upper lobe of the left lung is similar. The lower lobe is greatly enlarged. Cut surface showed some large white or yellowish areas which are firmer than the remaining tissues and filled with exudate. Subjacent to the bulging of the right costo chondral junction was the heart. The thymus was not enlarged and the heart and great vessels were pushed over to the right; the apex was against the right border of the sternum. The heart was freely movable. The pericardial attachment of the diaphragm was more to the right than the left and this maintained after the emphysematous left lung was removed. There were no enlarged glands around the great vessels. The heart and blood vessels appeared normal. On opening the trachea there was considerable purulent secretion encountered. In the left main bronchus, just below the bifurcation of the trachea, a gray opaque membrane was seen, which was attached to the anterior wall of the bronchus by a broad base. This membrane was somewhat tongue-shaped and was somewhat friable. The left bronchus below this contained much pus and there were multiple abscess scattered throughout the lobe. At the bifurcation of the trachea a lymphnode, 1 c.m. in diameter, was encountered. This did not seem to be pressing against the bronchus. No foreign body could be found. The right lung was small but no definite antemortem pathology seen except the bronchitis. No other anomalies or pathological conditions found. Smears of the abscess from the left lung shows a gram positive diplococcus. Microscopic examination by Dr. Roy Hammack,—section of the bronchus at the point of attachment of the membrane shows that this membrane consists of fibrin, leucocytes, and a few disintegrating blood cells. A few epithelial cells are entangled in it. At the point of attachment there was an absence of surface epithelium and marked leucocytic infiltration of superficial layers but none of the deeper layers of bronchial wall. Sections from the gray portions of the lung show large alveoli and dilated bronchi filled with pus cells. Section of lymphnode adjacent to bronchus showed mild inflammatory change. No evidence of tuberculosis.

Comment: The diagnosis was made of a congenital web at the beginning of the left bronchus for the following reasons:

1. Some congenital condition was present at birth as evidenced by the difficult respiration.

2. The cardiac displacement occurred three months before the present illness.

3. There was a definite membrane seen through the bronchoscope and found at post-mortem.

The microscopical section failed to show the connective tissue expected, but it seems reasonable that the intensity of the acute inflammation would mask the small amount of fibrous tissue in the original web. The possibility of the enlarged gland at the bifurcation of the trachea compressing the left bronchus with the subsequent formation of an exudate across the bronchus has to be considered. This can be ruled out by the fact that the gland was too small to compress the bronchus; that it was not tubercular but of an acute origin and secondary to the acute infection. The early absence of temperature and physical signs as well as the history makes the possibility of an organic foreign body unlikely.

In studying a large number of plates in the Bronchoscopic Clinic of Dr. Chevalier Jackson none showed the extreme cardiac displacement seen in this case nor in those cases was the heart constantly to the right of the sternum regardless of the respiratory cycle. The conclusion seems to follow that we were dealing with a congenital web in the left bronchus which partially occluded this orifice, that the child developed an acute respiratory infection causing a swelling of this membrane and that this acted as a valve trapping more and more air, producing a tremendous emphysema of the left lower lobe which displaced the heart and mediastinum to the right and terminated as a bronchial pneumonia.

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SEVERE BURN OF MOUTH FROM THE ACCIDENTAL INGESTION OF GRANULATED LYE.

DR. PORTER P. VINSON, DR. HERMAN MOERSCH, Rochester, Minn.

The accidental or suicidal ingestion of a solution of lye is the most common cause of benign stricture of the esophagus. It is, however, quite unusual to observe more than superficial ulceration of the tissues of the mouth and pharynx following such an accident. The ingestion of granulated lye, on the other hand, may result in severe ulceration of the mouth without producing a burn of the esophageal mucous membrane. In the latter case the caustic is expectorated before any of it comes in contact with the mucous membrane of the esophagus, as is illustrated in the case reported here.

REPORT OF CASE.

A girl, aged four years, came to the Mayo Clinic, December 11, 1923, suffering from a severe burn of the lips, face, and inside of the mouth, that had followed the accidental ingestion of granulated lye three days before (Fig. 1). The child had mistaken the lye for sugar, and had taken it in a teaspoon. As soon as the caustic touched the mouth, it produced severe pain, and the mother thought that none of it was swallowed.

When the child was admitted to the hospital, there was deep ulceration of the lips and tissues of the buccal cavity, and because

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of the intense discomfort, she could not be persuaded to take food or fluid by mouth. Proctocylsis was started at once and within twenty-four hours, fluids were being taken orally. Convalescence has been uneventful except for the scarring of the mouth and lips that has resulted from the contracture following the healing of the ulcerated tissues (Figs. 2 and 3).

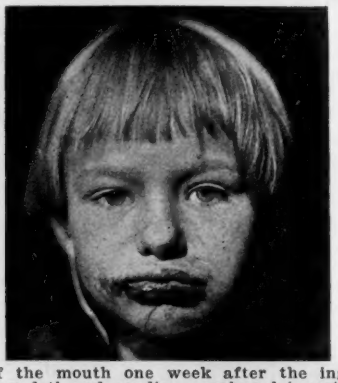

Fig. 1. Burn of the mouth one week after the ingestion of caustic. Patient has swallowed thread pending esophagal investigation.

Fig. 2. Contracture of the lips one month after accident. Thread still in place.

Fig. 3. Contracture of the lips four months after accident. As the patient has been free from esophageal symptoms, the thread has been removed.

So far as has been determined, the esophagus is not affected, and the patient can swallow any type of food that can be taken into the mouth. It will probably be necessary to perform one or more plastic operations to overcome the facial deformity, but the ultimate result should be satisfactory.

FOREIGN BODIES OF DENTAL ORIGIN IN THE LUNGS: ANALYSIS OF ONE HUNDRED AND SEVENTEEN CASES.

Dr. Elbyrne G. Gill, Roanoke, Va.

In presenting this subject a careful and painstaking effort has been made to analyze the reports of all cases that have been published in this, as well as in foreign countries. No attempt to review cases through personal communication has been made. A few cases giving fragmentary reports of foreign bodies of dental origin have been reviewed but not included in this analysis as it is the purpose of this contribution to give an accurate and complete analysis of only those cases reported in detail up to the present time. There have undoubtedly been many more cases of this type, but not published

We are all familiar with the work of our contemporaries in this particular field. The most comprehensive report hitherto made is that by Hedblom. It is to his tabulation that I am indebted for clues to some of my references. Arrowsmith, Wood, Hoffman, Jackson and Forbes, as well as many others, have made contributions to this subject. A review of the older literature is of interest in that we find that as early as 1717 Verdon performed a "Bronchotomy" for a foreign body in the trachea. In 1854, years before the laryngoscope and bronchoscope were in use, Gross published an exhaustive work on the subject of "Foreign Bodies in the Air Passages". In 1860, Horace Green wrote a paper on "The Difficulty and Advantage, of Catheterism of the Air Passages in Diseases of the Chest", embodying the work of several years and reporting on 106 cases treated.

The present analysis includes foreign bodies of the following types: Teeth, dental burrs, gold crowns, dental plates, fillings, blade of forceps, plaster of paris, hard rubber from dental mouth gags, discs of Allen's dental cement and nerve canal reamers. The case previously reported by the writer will be included in this report.

The order of occurrence is as follows: Teeth 76, artificial teeth 6, dentures or dental plates 8, dental burrs or instruments 9, crowns (gold) 7, dental fillings 3, blade of forceps 1, plaster of paris 1, hard rubber from dental mouth gags 1, disc of Allen's dental cement 1, nerve canal reamers 1, gold three-tooth bridges 2, dental broaches 1, tarter from teeth 1.

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Location of foreign bodies: In this type as well as in other types of foreign bodies the right bronchus is the favorite site of lodgement, the ratio being 2 to 1 in the series, 56 being in the right and 28 in the left bronchus, 1 in the trachea. The exact location in each bronchus is given in the table. The location was not stated in 29 cases.

Nature of accident: The majority of accidents occurred while the patient was under anesthetic, gas anesthesia having been employed in 19 cases, ether in 20, chloroform in 3, rectal anesthesia, 1 case. In case reports stating that extraction had been done under general anesthesia, it was suposed that ether had been used and this probably accounts for the greatest number of accidents occurring under ether anesthesia. The remaining accidents occured in the following order:

Aspirated: time not stated, 4; during sleep, 2; while eating, 1; while coughing, 2; while in dental chair, 9; when kicked by a horse, 1; when making cast for mouth, 2; while in Petit-mal, 2; while in intoxicated stupor, 1.

The nature of accident was not stated in 50 cases. In all but one case some operation about the mouth was being performed when the accident occurred.

Symptoms and signs: The most constant and definite symptom is a cough, which varies from an occasional one to one that is persistent and accompanied by profuse expectoration. A case reported by Chambers is the only one which did not have cough as an early or late symptom. (Sojourn of foreign body, five days.)

In this series 64 cases developed a cough as an early or late symptom. Cough was the only symptom in 6 cases, dyspnea was present in 17, pneumonia (pneumonia is so often erroneously diagnosed by misinterpretation of the physical signs in foreign body cases that it may well be question whether true lobar pneumonia existed in these 2 cases) in 2, cyanosis in 2, pain in chest in 28, hemoptysis in 14, nausea in 1, elevation of temperature in 19, profuse expectoration in 40, consolidation of lungs in 5, night sweats in 4, and in one case reported by J. Isarel the secretion from the bronchi contained actinomycotic rosettes (sojourn of foreign body 1½ years). The symptoms were not stated in 31 cases. Thirty-two cases developed lung abscess. Of this number 17 recoverd, 13 died and the results were uncertain in 2 cases. No distinction has been made between the early and late symptoms, both being included under one classification.

Sojourn: The sojourn in the lungs of the foreign bodies presented in this series varied from four hours to thirteen years. In

the case of short duration, the foreign body was removed bronchoscopically by Forbes. This patient was in a dental chair having a gold crown fitted to the right upper canine tooth. The crown became loosened during a fit of coughing and disappeared. The suspicion of the dentist was aroused by the immediate development of coughing and an X-ray examination of the chest was ordered. The management of this case by the dentist is worthy of being followed by others of his profession.

In the case of thirteen years' duration, reported by W. C. Carpenter in 1842, four false teeth on silver clamps were aspirated during a fit of coughing. X-ray examination was not made and bronchoscopy not attempted. Patient died, post-mortem findings given under that classification.

Treatment: The expectant or symptomatic treatment was employed in 38 cases. Of this number 19 recovered and 16 died. The results were uncertain in 3 cases, peroral bronchoscopy was employed in 44 cases, being successful in 38, which completely recovered.

Lower bronchoscopy through tracheal wounds was successful in 6 cases. All of these recovered. Thoracotomy for drainage of lung abscess was necessary in 23 instances, with 13 recoveries, 6 deaths and uncertain results in 4 cases. Tracheotomy was performed 4 times, with 3 successes and 1 failure. Artificial pneumothorax was successfully employed in one instance. One of the 6 bronchoscopic failures was complicated by a lung abscess and later resulted in death. Another death followed a partial pneumonectomy, four previous attempts to remove the foreign body bronchoscopically having failed. This foreign body, a dental burr, had lodged in the upper outer lobe bronchus. This case report is obtained from Hedblom's tabulation and the writer has been unable to confirm it as the references are not available.

In the remaining four bronchoscopic failures, the patients recovered. The foreign bodies were probably coughed up.

Results: Of the 117 cases in the entire series, 84 recovered. The results were uncertain in 9 and there were 24 deaths. Fourteen patients died as the result of lung abscess, 1 following tracheotomy, 3 from symptoms simulating tuberculosis, 1 from bronchiectasis, 1 from pneumonectomy, and 3 cases the cause of death was not stated.

Of the 84 cases which recovered, the foreign body was removed bronchoscopically in 38 instances, it was coughed up in 37 instances, removed by lower bronchoscopy, through tracheal openings in 5 instances, by successful tracheotomy in 3 and 1 case was relieved by artificial pneumothorax.

POST-MORTEM FINDINGS.

H. Bayer: Tooth causing lung abscess.

W. C. Carpenter: Fistula of lung opened into large empyema cavity containing pus. Lung collapsed, denture with four teeth found in the pleural cavity. Left lung tubercular.

Robinson (Mayo Clinic): Bilateral bronchiectasis, left empyema, tooth in lower lobe of right lung.

R. J. Goodlee: Advanced bilateral tuberculosis, cavity of right apex, tuberculosis of the caecum bilateral lower lobe, bronchiectasis, tooth in lower right lobe of bronchus.

J. Israel: Cavitation in left lung, fragment of tooth in pleural cavity.

J. S. Warrack: Complete obstruction of left main bronchus. Whole lung gangrenous, crowned bicuspid, tooth wedged into bronchus; ball valve obstruction.

A. E. Wigg: Large, empty empyema, small abscess in middle lower lobe, bicuspid tightly impacted.

T. K. Monro: Entire lung gangrenous.

R. Morrison: Pericarditis; tooth stump impacted in bronchus; missed in resection by three-fourths inch.

Fowler: Tooth found impacted in a secondary bronchus.

A. Poulet: Right lung was adherent. Exudation marked piece of tooth in hilus of right bronchus.

J. Schulz: Advanced tuberculosis in both lungs, with large cavity in right bronchiectasis. Tooth found in bronchial bifurcation.

F. J. Tees: Small piece of tarter found in abscess in right lung, connecting with interlobe or abscess and so with pleural cavity.

C. Wall: Tooth plate found in right bronchus, secondary bronchiectasis of right lower lobe. Septic pneumonia in left lung.

Remarks: Foreign bodies of dental origin produce symptoms similar to those arising from other inorganic objects. The train of symptoms to be expected are cough, pain in chest, hemoptysis and dyspnea. These may be the only symptoms produced for years while on the other hand lung abscess may develop within a very short time. Warrick and Monro report cases of death on the tenth and on the sixteenth day following the aspiration of teeth. In each instance the entire lung was gangrenous.

This much can be said with certainty, "If a foreign body is aspirated into the bronchi and allowed to remain, abscess formation will likely follow, in the majority of cases."

In this series there were two cases of foreign bodies, of five years' sojourn in the lungs, which produce no symptoms other than cough

and hemoptysis. In one case reported by Lynch, plaster of paris had been aspirated, and in the other case reported by the writer, the foreign body was a dental plate. Both cases made complete recoveries after bronchoscopic removal.

When dental work has been done and any portion of the denture is missing after the operation, the dentist should satisfy himself that the tooth is not in the bronchi. The importance of this is readily realized by a study of this series of cases. When the object was coughed up or removed early there was no complication, but in the neglected cases abscess formation was the result.

A diagnosis can be made by the history in many cases. If not, an X-ray should be made and should this not be conclusive, bronchoscopy in skilled hands should be performed.

The indications for bronchoscopy for a foreign body as outlined by Jackson are as follows:

1 The appearance in the Roentgenogram of a foreign body or of any suspicious shadow.

2 Cases in which a clear history is given of the patient's having choked on a foreign body and in which the foreign body was not afterwards found.

3 Cases in which there are signs of stenosis of the trachea or the bronchus.

4 In any case suspected of bronchiectasis.

5 In the absence of any history of a foreign body, the patient giving symptoms of pulmonary tuberculosis, without the finding of bacilli in the sputum, and especially if the physical signs are at the right base, and, above all, if there are also physical signs of pleural effusion.

6 In case of doubt, bronchoscopy should be done.

Jackson recognizes no absolute contra-indications to bronchoscopy.

If the presence of a foreign body has once been definitely established there is only one treatment—bronchoscopy. In this connection mention should be, again, made of the results obtained by bronchoscopy in this series—44 bronchoscopies without a death. In 6 cases the foreign body was not found, but no deaths were directly attributable to the operation.

If a study of this series of cases can be taken as an index for all types of foreign bodies, no argument can be sustained in favor of the so-called expectant or symptomatic treatment. Of the 38 cases treated by this method, 16 died, while of the 38 cases receiving early bronchoscopic treatment all recovered. As regards the expectant treatment, Jackson says: "We do full justice to our patients when

we tell them that while the foreign bodies may be coughed up it is very dangerous to wait; and further that the difficulty of removing increases with each hour the body is allowed to remain."

When the amount of dental surgery being done is contrasted with the small number of dental objects aspirated, the dental profession is to be congratulated for its excellent surgical technique. Gardner, of the Mayo Clinic, employs the following technique for prevention of accidental aspiration of foreign bodies." The patient should be watched quite as carefully with a local anesthetic as with a general one. The use of gauze sponges in no way interferes with the work of the operation and cares also for the hemorrhage. Furthermore, the dentist may, by careful examination of the teeth before operation, ascertain if the work might displace pieces of tarter fillings or even the teeth themselves during the anesthetic. The condition of the patient undergoing any operation often requires the use of the gag during an ether anesthetic, and the anesthetist should know the condition of the patient's teeth before the anesthetic is started, since such an instrument often displaces from a tooth foreign bodies which might be inhaled.

CONCLUSIONS.

1 In every operation about the mouth care should be exercised to prevent aspiration infection.

2 Symptoms in most cases are immediate, namely, cough, pain in chest and hemoptysis.

3 Later symptoms may simulate pulmonary tuberculosis. Seven cases in this series were diagnosed as tuberculosis. Tuberculosis may co-exist with lung abscess.

4 Bronchoscopy is indicated in any case as a diagnostic measure if the history and X-ray findings are not conclusive.

5 When the presence of a foreign body has been definitely established there is only one treatment—bronchoscopy.

6 Expectant treatment is always hazardous and lung abscess may devlop at any time.

7 Death is due in most instances to lung abscess, bronchiectasis and gangrene.

Case report: Patient, I. F., age 50 years, was referred to me, Feb. 19, 1920, by Dr. B. L. T.

Patient gave the following history: Seven years ago was struck in the left temporal region by an axe, which rendered her unconscious. Since that time at various intervals she has been subject to attacks of epilepsy. Five years ago during an epileptic seizure, patient fell and struck her head upon a cement floor, a plate of false teeth was broken and a small portion of the plate was never found

Dental and Surgical objects

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Arnolds, A.	23F	Artificial tooth plate	Lower right bronchus	While eating	Extreme dyspnoe; spasmodic cough	Two months	Thoracotomy operation twice interrupted on account of hemorrhage	Foreign body coughed up after operation complete recovery		One of the early instances of X-Ray localization. Bronchoscopy not attempted.
Abercrombie	?F	Artificial tooth	Not stated	Nature of accident not stated	Paroxysmal cough and dyspnea, becoming more frequent; purulent expectoration; rapid pulse	Two years and seven months	Not stated	Tooth coughed up; improvement, followed by return of symptoms, hemoptysis death		Bronchoscopy not attempted
Bayer, H.	9M	Deciduous tooth	Right bronchus		Pain in right side of chest	Not stated	Not stated	Death	Tooth causing lung abscess	Not diagnosed until autopsy
Brauch, T.	22F	Premolar tooth	Not stated	Teeth extracted under chloroform anesthesia	Slight dysponea, later lung abscess	Two years	None	Coughed up ultimate recovery		Bronchoscopy not attempted
Batchelder	65?	Set of teeth	Not stated	Not stated	Not stated	15 months	Coughed up	Recovery		Bronchoscopy not attempted
Barker	? ?	Tooth	Right bronchus	Not stated	Not stated	Not stated	Thoracotomy for removal of foreign body	Died while being chloroformed for operation	Gangrene and empyema	Bronchoscopy not attempted
Carpenter, W. G.	35M	Four false teeth on silver clamp	Right pleural cavity	Aspirated tooth in fit of coughing	First 11 ½ years occasional attacks of shortness of breath, fever, pain in chest cough, dulness of right chest	13 years	Symptomatic	Died 13 years after the accident	Fistula of lung opened into large empyema cavity containing pus. Lung collapsed denture with four teeth found in the pleural cavity. Left lung tubercular	Bronchoscopy not attempted X-Ray not made
Chambers, T. R.	35F	Molar tooth	Left bronchus	Extraction under gas	Severe epigastric pain, dyspnoe, nausea, prostration, elevation of temperature	Five days	None	Coughed up 6th day		All symptoms disappeared in five weeks. Bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Childs, S. B.	24F	Molar tooth and portion of crown	Second bifurcation of the lower right bronchus	Extraction of teeth general anesthesia	Harassing cough diagnosed as T. B.	Several weeks	Bronchoscopic removal	Not stated		Probably recoverd but not stated. Successful bronchoscopy
Clayton, T. A.		Tooth	Lower right bronchus							Successful bronchoscopy
Cragie, (1834)		Artificial tooth	Not stated	Not stated	Chronic cough	Two years	Not stated	Tooth coughed up; temporary improvement, followed by return of symptoms, hemoptysis, death		Bronchoscopy not attempted. Death with symptoms of tuberculosis
Davies, J. D.	?F	Second bicuspid tooth	Right bronchus	Extraction under gas anesthesia	Pain in chest, severe cough, profuse expectoration	Seven mos.	No surgery	Coughed up and recovery		Diagnosed and treated as T. B. Bronchoscopy not attempted
Dickson, W. E. C.	28M	Stump of upper molar	Left bronchus	Extraction under gas	Cough with slight uneasiness behind the sternum no pain	13 ½ months	Symptomatic	Sudden recurling haemoptysis, coughed up tooth recovery		Diagnosed tuberculosis by several consultants. Bronchoscopy not attempted
Forbes, H. H.	82M	Gold crown	Right main bronchus	Aspirated while in dental chair	Coughing immediately	4 hours	Bronchoscopy	Removal		Located by X-Ray. Removed with Bruning type bronchoscope
Forbes, H. H.	47M	Tooth plate	Left primary bronchus	Aspirated while asleep	Not stated	Several mos.	Bronchoscopy	Removal cured		Removed by bronchoscopy. Located by X-Ray
Forbes,	39F	Root for tooth	Left bronchus	Extraction of teeth under general anesthesia	Within a few weeks a constant cough developed, accompanied by profuse purulent expectoration	16 months	Symptomatic	Coughed, lung abscess in left upper lobe, ultimate recovery		Bronchoscopy not attempted until foreign body had been coughed up and then for the purpose of treating abscess cavity

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Forbes, H. H.	42F	Tooth	Left primary bronchus	Extraction of teeth under general anesthesia ether	Cough and asthmatic attacks	Two months	Not stated	Bronchoscopy removal cured		Located by X-Ray and removed by bronchoscopy
Forbes, H. H.	35M	Dental filling	Left bronchus	Extraction of teeth under gas anesthesia	Immediate irritation in chest and cough	24 hours	Bronchoscopy unsuccessful on 2 occasions	Probably coughed up; cured		First and second pictures showed presence of foreign body. Third picture taken on 3rd day. Foreign body disappeared Bronchoscopy unsuccessful
Freidberg	24F	Tooth	Right bronchus	Extraction of ten teeth	Immediate cough, pain in right side late symptoms increased cough, foul sputum and fever, pain in chest, loss of weight	9 weeks	Foreign body removed in upper lobe. Bronchoscopy under ether 9 weeks after accident	Expectoration and cough continued for several months, future history unknown		Bronchoscopy successful
Friedberg, F. A.		Tooth	Lower part of right lung	Extraction of teeth under general anesthesia	Cough with expectoration	A number of months	Bronchoscopic removal	Lung abscess had developed symptoms abscess persisted after removal		
Fowler		Teeth	Lower left bronchus	Not stated	Not stated	Not stated	Thoracotomy failed	Patient died later	Tooth found impacted in a secondary bronchus	Bronchoscopy not attempted
Gardner, W. T.	29F	Crown of tooth	Right bronchus	Extraction of teeth under chloroform anesthesia	Elevation of temperature, cough, haemoptysis	15 months	No surgery	Coughed up and recovery		Diagnosed and treated as T. B. Bronchoscopy not attempted
Gill, E. G.	50F	Dental plate	Right bronchus	Aspirated during epileptic attack	Cough haemoptysis	Five years	Symptomatic, later bronchoscopic removal	Removal, complete recovery		Bronchoscopy successful

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Goodlee, R. J.	47M	Molar tooth	Lower right bronchus	Not stated	Extreme dysponea immediately, spasmotic cough purulent sputum, emaciation, signs of abscess	14 months	Drainage of abscess, no foreign body found	Died 14 mos. after accident	Advanced bilateral tuberculosis cavity of right apex tuberculosis of the caecum bilateral lower lobe, bronchiectasis tooth in lower right lobe of bronchus	Bronchoscopy not attempted
Getchell	24F	Root of tooth	Lesions in both bases most marked on left	Extraction of several teeth under ether	Immediate symptom—indefinite left pleurisy late symptoms pain, cough, foul sputum intermittent fever, haemoptysis pneumonia	2 weeks	Drainage of lung abscess	Expulsion 2 weeks after accident recovery		Recurrence of abscess. Bronchoscopy not attempted
Getchell	16F	Tooth	Right bronchus	6 teeth extracted under gas	Immediate ailing, late after 3 ½ mos. typhoid bronchitis in bed from 3 to 4 weeks breath offensive cough, foul sputum, chronic cough, purulent sputum	1 year	Postural treatment, much improvement	Expulsion 1 year after accident but results not known		Bronchoscopy not attempted
Hedblom	66M	Tooth	Right upper lobe of bronchus	Many teeth extracted	Immediate symptoms dull pain in lower right chest bled considerably cough, sputum with foul odor later symptoms, cough, and sputum for 4 wks. after teeth extracted chills, sudden expectoration of pint of foul pus	Five months	Thoracotomy for drainage of lung abscess	Complete recovery		Tooth discharged thru wound 5th month after operation. Bronchoscopy not attempted
Hedblom, (Mayo Clinic)	45M	Tooth	Not stated	26 teeth extracted under ether	Cough, foul sputum, fever dulness of right chest	Not stated	Thoracotomy for drainage of gangrenous lung abscess	Complete recovery		Bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Hedblom (Mayo Clinic)	63M	Tooth	Not stated	Kicked by horse	Immediate symptoms cough for 24 hours tarry stool late symptoms 8 wks. after accident pneumonia, haemoptysis purulent sputum, pain in chest fever, loss of weight abscess broke	8 weeks	Thoracotomy for drainage of lung abscess	Complete recovery		Bronchoscopy not attempted
Hedblom (Mayo-Clinic)	39F	Tooth	Left lower lobe	Teeth extracted under ether	Immediate symptoms cough, late symptoms, moist rales tuberculosis breathing dulling of fingers, haemoptysis, chronic cough and foul sputum	Not stated	Thoracotomy for drainage of lung abscess	Complete recovery		Bronchoscopy not attempted
Hedblom, (Mayo-Clinic)	33F	Two teeth and silver filling	Right lower lobe	Teeth extracted under ether	Cough and purulent sputum, cupful each day	Two pieces of tooth in 6 weeks filling in 5 wks.	Thoracotomy for drainage of lung abscess, 1st stage of operation	Uncertain		Bronchoscopy not attempted
Hedblom, (Mayo-Clinic)	30F	Teeth	Right bronchus	Extraction of several teeth	Paroxysmal cough substernal pain on right, sweating frequent vomiting rales, increased breath sounds	Expulsion 3 months after accident	None	Recovery		Very little cough and sputum months after expulsion of teeth. Bronchoscopy not tried
Himmelsbach G. A.	21F	Tooth	Left Bronchus	Five teeth extracted under gas anesthesia	Periodic dysponea violent cough wheesing cough, sputum haemoptysis signs of bronchitis	4½ months	None	Complete recovery after coughing up tooth with cotton packed in cavity. Immediate relief of symptoms		Bronchoscopy not attempted
Hubbard		Tooth	Not stated	Dental operation	Immediate not stated, chronic cough purulent sputum	Several mos.	None	Spontaneous recovery after several months		Bronchoscopy not attempted
Hubbard		Tooth		Dental operation	Immediate symptoms not stated late symptoms chronic cough purulent sputum	Several years	None	Spontaneous recovery after several years		Not very ill at any time. Bronchoscopy.

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Hubbard	34F	Disc Allen's dental cement 7x9mm.	Left lower lobe bronchus	Extraction of 22 teeth under ether	Immediate cough almost continuous during waking hrs. Late symptoms, fever cough foul muco-purulent sputum, emaciation, tuberculosis diagnosed	7 months	Bronchoscopic removal 7th month	Recovery perfect gain in weight 34 lbs.		Bronchoscopy successful
Huston, (cited from F. A. Hoffman)	20F	Molar tooth	Right bronchus	Not stated	Pneumonia pleuritis	11 days	Not stated	Death		
Hickey, P. M.	21F	Tooth and part of crown	Right bronchus	Extraction of teeth under gas anesthesia	Severe cough	Five months	Bronchscopy (peroral) unsuccessful tracheotomy. Bronchoscopy 3 tracheal openings	Tooth removed complete recovery		Patient treated for T. B. for 5 mos. Bronchoscopy done under ether anesthesia
Ibid (cited from F. A. Hoffman)	39F	Tooth	In bronchus exact location not stated	Not stated	Consolidation upper right lung followed by ulceration of bronchus and abscess after tooth coughed up	Not stated	Not stated	Death		Bronchoscopy not attempted
Ibid (cited from F. A. Hoffman)	27F	Tooth	Right bronchus	Not stated	Cough, fever, impaired resonance over right lung posteriorily, purulent sputum	12 weeks	Not stated	Coughed up recovery		Not diagnosed as foreign body until coughed up bronchoscopy not attempted
Ibid (cited from F.)	30F	Tooth	Right bronchus	Not stated	Coughed up blood and pus. Abscess of lung	Not stated	Treachotomy	Death		Doesn't state how diagnosis was made. Bronchoscopy not attempted
Israel, J.	26M	Fragment of tooth	Left lower lobe	Not stated	Immediate symptoms not stated later symptoms pain in left chest, purulent sputum, sinuses and retraction of chest wall marked emaciation pus contained. Actinomyeotic rosettes	1 ½ years	No surgical treatment	Died 1 ½ years after onset of symptoms	Cavitation in left lung fragment of tooth in plural cavity	Patient a hucster, drank out of the same trough as his horse, bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Jackson, C.	26F	Amalgam tooth filling	Left lung	Extraction under gas anesthesia	Late symptoms, severe coughing paroxysms and sweating, no immediate symptoms	Two weeks	Bronchoscopy	Removal, complete, cured		Foreign body located by X-Ray. Successful bronchoscopy
Jackson, C.	39?	Dental instrument	Right inferior lobe	Not stated	Not stated	7 days	Not stated	Extraction cure		Slight local congestions. Broncoscopy successful
Jackson, C.	30?	Dental instrument	Left upper lobe bronchus	Not stated	Not stated	3 months	Not stated	Extraction cure		Areola inflammation patch of purulent exudate. Successful bronchoscopy
Jackson, C.	26?	Dental instrument	Right middle lobe bronchus	Not stated	Not stated	2 days	Not stated	Extraction cure		Small faint areola at point of puncture, bronchoscopy successful
Jackson, C.	51?	Portion of tooth	Right lower lobe bronchus	Not stated	Not stated	4½ years	Not stated	Extraction		Four bronchoscopies done at intervals. Myocardial disease
Jackson, C.	18?	Dental instrument	Posterior branch of left inferior bronchus	Not stated	Not stated	1 month 9 Days	Bronchoscopy	Extraction cure		Trachea red and inflammatory in marked contrast to pallor of the pharyngeal, mucosa; left bronchus high degree of inflammation with adherent globular masses of thick tough secretion
Jackson, C.	21?	Dental instrument	Right upper lobe bronchus	Not stated	Not stated	15 days	Not stated	Extraction cure		Bronchoscopy successful
Jackson, C.	43?	Band of gold crown	Left lower lobe bronchus	Not stated	Not stated	13 days	Not stated	Extraction cure		Intense laryngitis, exudaye granulation tissue
Jackson, C.	45?	Dental instrument	Right inferior lobe bronchus	Not stated	Not stated	10 days	Not stated	Extraction cure		Very slight localized bronchitis
Jackson, C.	12?	Tooth	Right stem bronchus	Not stated	Not stated	3 months	Not stated	Extraction cure		Bronchoscopy successful

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Jackson	22F	Tooth	Branch of the right inferior lobe bronchus	Not stated	Not stated	51 days	Not stated	Extraction cure		*See Footnote.

* First attempt—One branch of middle lobe bronchus and one branch of inferior lobe bronchus swollen shut. Except for a small lumen it was filled with a bed of pus in each case. Both swollen bronchial orifices were dilated with forceps used during expansion. The orifice of both bronchi contained granulations and in the middle lobe bronchus there was a hard substance palpable with forceps, but it was not free to move. Second attempt—Orifice of branch of middle lobe bronchus seemed to be normal in the inferior lobe bronchus the anterior branch which before was seen to be swollen shut; was more patulous though occupied by granulation tissue. This was removed and the orifice dilated with forceps. Tooth found with one end presenting. This was seized and tooth found to be freely movable and came away on very gentle traction, 6 min. 25 sec.

Jackson, C.	63?	Gold crown	Right lower lobe bronchus	Not stated	Not stated	12 days	Not stated	Extraction cure		Unfavorable presentation converted to favorable one by version
Jackson, C.	31?	Root of tooth	Right stem bronchus below largest posterior branch	Not stated	Not stated	Not stated	Not stated	Extraction cure	Not stated	** See Footnote.

** Trachea and carina inflamed; right stem bronchus below upper lobe bronchus very red and the mucosa swollen. Granulations filled stem bronchus below middle lobe bronchus. Right inferior lobe bronchus bromchiectatic. Considerable quantities of pus and bl od kept coming constantly up from the inferior lobe branch bronchi. Odor of breath and pus characteristically saprophytic but not quite so foul as in most foreign body cases of pro!onged sojourn.

Jackson, C.	44?	Gold 3 tooth bridge	Right main bronchus at orifice of upper lobe bronchus	Not stated	Not stated	Five days	Not stated	Extraction cure		Localized bronchitis pus, size of foreign body 3 cm.x1.5 cm. circumference 4 cm.
Jackson, C.	45?	Portion tooth plate	Left main bronchus	Not stated	Not stated	Four months	Not stated	Extraction cure		Foreign body lying free in left bronchus above orifice of upper lobe bronchus. Slight degree of localized reaction only. Right bronchus and trachea looked normal
Jackson, C.	29?	Tooth	Right stem bronchus	Not stated	Not stated	8 months	Not stated	Extraction cure		*** See Footnote.

*** Large mass of granulation tissue in right stem bronchus just below the orifice of the middle lobe bronchus. Bronchial wall stenosed apparently by perichondritis the proximal swelling quite firm.

Jackson, C.	14?	Tooth	Right main bronchus	Not stated	Not stated	23 days	Not stated	Extraction cure		**** See Footnote.

**** Right main bronchus swollen almost shut outline eliptical, axis from 10 to 4 o'clock walls collapsed to contact during expiration opening again during inspiration middle lobe bronchial orifice completely cesed by swelling and compression ot the tooth, tooth found body upward, in stem bronchus the top of the body being flush with the spur between the middle lobe brocnhial orifice and inferior lobe bronchial orifice. As soon as tooth was disturbed by sponging away the blood stained secretion large quantities of pinkish pus were liberated. The pus having the same foul odor as the breath as noted at the start of bronchoscopy.

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Jackson, C.	49F	Amalgam tooth filling	Lung tissue of right lower lobe	Not stated	Not stated	7 months	Not stated	Extraction cure		Lower lobe bronchus intensely inflamed pus coming up from small median branch
Jackson, C.	29?	Tooth	Right stem bronchus just below orifice of middle lobe	Not stated	Not stated	66 days	Not stated	Extraction cure		Bronchoscopy successful
Jackson, C.	30?	Gold crown	Right main bronchus at orifice of middle lobe bronchus	Not stated	Not stated	Two days	Not stated	Extraction cure		Mucosa of entire tracheobronchial tree much reddened. No granulations present. Some mucopus
Jarvis	50M	Tooth and crown	Left bronchus	Extraction of lower left wisdom tooth	Dysponea cough, great prostration fever, sibilant rales slight sputum	Five days	None	Spontaneous expulsion five days after accident recovery		Root and crown expelled in violent paroxysm of coughing with haemoptysis
Hug, T.	30M	Dental plate	Right main bronchus	Aspirated during sleep	Difficult breathing	3 days	Bronchoscopic removal	Removal recovery		Located by X-Ray, plate consisted of three teeth. Upper bronchscopy. Patient sitting
King, J. W.	23F	Molar stump	Not stated	Extraction under gas	Pain in chest and constant dry cough	10 days	None	Tooth coughed up recovery		Foreign body not suspected until coughed up. Bronchoscopy not attempted
Korteweg, J. A.	23F	Artificial tooth	Right bronchus	Aspiration	Harassing cough	2 months	Thoracotomy	Tooth not found coughed up 4 hrs. after operation recovery		Bronchoscopy not attempted
Kulbs	48M	Piece of carious tooth	Upper right lobe	Not stated	Immediate, not stated, late- four hundred c. c. of foul sputum containing elastic tissue fibres; signs of cavity duration of symptoms 3 months	One month	Thoracotomy for drainage of lung abscess	Marked improvement small fistula two months after operation		Bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Landis, H. R. M.	34M	Wisdom tooth	Right bronchus	Teeth extracted under gas anesthesia	Severe pain in right chest, constant cough loss of weight and night sweats	14 months	Sanitorium treatment for T. B. Thorocatomy and pus evacuated	Tooth coughed up, recovery		Bronchoscopy not attempted
Leaming	?M	Tooth	Bronchus	Not stated	Not stated	One day	Tracheatomy	Coughed up several hours after operation recovery		Bronchoscopy not attempted
Martin, C. F.	27F	Tooth	Right bronchus	Extraction of teeth under ether anesthesia	Pain in chest, cough expectoration of purulent material fever and night sweats	Several weeks	Artificial pneumothorax	Recovery		X-Ray showed abscesses cavity Bronchoscopy not attempted
Friedberg, F. A.	35M	3 tooth bridge	Left main bronchus	Aspirated during intoxicated stupor	Cough moderate dyspnoea, soreness on pressure	Not stated	Removed with fluorscopic bronchoscopy	Recovery		Ordinary bronchoscopy failed on account of hemorrhage from lungs
Friedberg, F. A.	46M	Dental broach	Left main bronchus	Dental operation	Cough	3 days	Not stated	Broach coughed up, recovery		Bronchoscopy not attempted on account of inability of patient to open mouth
Lynch, R. C.	2F	Plaster of Paris	Pieces in both lungs	Inhaled during modeling for false teeth	Cough	5 years	Bronchoscopic removal	Marked constriction of bronchioles dilated at time of removal, recovery		Bronchoscopy successful
Lynch, R. C.	?F	Plaster of Paris	Left bronchus	Making cast of mouth	Persistent spasmodic cough	5 years	Bronchoscopic removal of plaster of Paris from lungs	Complete recovery gained 30 lbs. in weight		Bronchoscopy successful
Mayer, E.		Gold crown of wisdom tooth	Not stated	Dental operation under rectal anesthesia	Not stated	Not stated	Bronchoscopic removal	Recovery		Bronchoscopy successful
MacCormack W.	24F	Blades of tooth forceps	Right bronchus	Teeth extraction forceps broke chloroform	Immediate violent spasmodic cough, extreme cyanosis severe cough in chest, late symptoms cough dyspnoea pain in right chest	Not stated	Tracheotomy. Instrumental removal	Complete recovery		Great difficulty experienced in getting hold of blade. Does not state whether bronchoscope was used

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Medico Legal Reports		Porcelain tooth	Right bronchus	Not stated	Not stated	3 years	None	Spontaneous expulsion after 3 years		Verdict for plaintiff; damages 750 pounds. Bronchoscopy not attempted
Murphy, J. W.	37F	Porcelain tooth	Right lower bronchus	Extraction under gas anesthesia	None	5 days	Bronchoscopy	Cured		Bronchoscopy successful after second attempt
Manger		Dental burr	Trachea	Not stated	Not stated	Not stated	Tracheotomy burr not found	Recovery		Burr probably coughed up into nasopharynx during tracheotomy. Anesthesia spat out next day
Miller, J.		Tooth	Not stated	Not stated	Not stated	Not stated	Not stated	Lung abscess developed		No details of this given, simply noted in a general treatise of lung abscess
Moure, E. J. and Got, A.	40M	Tooth	Right bronchus	Not stated	Not stated	One day	Bronchoscopy partially successful finally tracheotomy	Recovery		No detailed case history, no further date given in table
Murrell, W.	22F	Tooth root	Bronchus not exactly located	Extraction of teeth under general anesthesia	Cough at first dry, later with offensive expectoration pain left chest, fever	2 years	Symptomatic medical serum	Tooth root coughed up temporary relief of cough followed by chronic bronchiectasis that persisted for 6 years		No X-Ray, protion of tooth root not exactly determined, operation refused by patient for bronchiectasis Vaccine treatment to be given, results not reported Bronchoscopy not attempted
Monroe, T. K.	10M	Tooth	Left bronchus	Loose tooth probably aspirated operation for tuberculosis of knee under ether	Immediate symptoms none, late symptoms cough and fever on 4th day rales, loss of vocal fremitus; offensive sputum 14th day	16 days	Symptomatic	Died 16 days after accident	Entire lung gangreneous	Bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Morrison, R.	34F	Tooth	Left bronchus	6 to 8 teeth extracted under ether	Immediate symptoms dysponea tightness in chest, said tooth had gone down in throat later symptoms after 3 wks. cough, fever, haemoptysis profuse fetid sputum loss of weight and strength	2 years	Thoracotomy, resection of large parts of lower of lung	Died of pericarditis on 28th day after operation	Pericaditis tooth stump impacted in bronchus missed resection ¾ inch	Diagnosis of bronchiectatis from foreign body was made only after two years of symptoms
Poulet, A.	?M	Root and portion of crown of molar tooth	Right bronchus	Extraction of teeth under general anesthesia	Catarrhal cough, attacks of pleurisy	One year	None	Death	Right lung was adherent exudation marked piece of tooth in hilus of right bronchus	Bronchoscopy not attempted Patient died with tuberculosis
Pepper		Deciduous tooth	Not stated	Not stated	Not stated	Not stated	Spontaneous coughed up	Recovery		Bronchoscopy not tried
Pirie	?M	Tooth		Extraction of several teeth	Late symptoms bloody expectoration, chills, pains in left side duration 6 days	Not stated	Thoracotomy for drainage	Complete recovery		X-Ray showed fluid level in abscess cavity. Bronchoscopy not attempted
Page, L.	46M	Portion of tooth	Right lower lobe	Teeth extraction under gas anesthesia	Cough and pain in right chest elevation of temperature	Several days	Bronchoscopy	Removal after second attempt		Bronchoscopy successful
Patterson,	54M	Molar tooth	Posterior branch of the right lower lobe bronchus	Extraction of teeth under general anesthesia	Constant cough expectoration of foul pus loss of weight	One year	At first systematic, later bronchoscopy	Removal of tooth, recovery		Bronchoscopy successful. Abscess formed
Purcell, C. E.	50F	Tooth root	Not stated	Extraction of teeth under general anesthesia	Cough, with expectoration, fever and nervousness	One month	Symptomatic	Tooth root coughed up expectoration of purulent material for a few days then complete recovery		No X-Ray made in this case and exact position of foreign body determined. Bronchoscopy not attempted
Robinson, (Mayo Clinic)	34F	Tooth	Right lower lobe	Teeth extracted under ether	Immediate symptoms cough, sputum pain in back, late symptoms cough, pint of foul sputum in 24 hrs. pain in chest, fever emaciation	8 months	Bronchoscopy, pus in right bronchus aspirating left pleural cavity pus, first stage operation drainage abscess of left lung	Died shortly after thoracotomy operation	Bilateral, bronchiectasis left empyema tooth in lower lobe of right lung	Tooth within 2.5 cm. of inferior surface of the lower lobe. Bronchoscopy unsuccessful

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Rinut, C. A. S.	22M	Tooth plate	Right bronchus	Swallowed during attacks of petitmal	Cough and pain in chest	2 days	Removal thru tracheotomy wound	Good recovery except slight bronchitis		One-half of the tooth plate was in the bronchus the other half passed per rectum, having been swallowed. Doesn't state that bronchoscope was used
Roush, S. A.	35M	Molar tooth	Not stated	Tooth loosened by a blow and supposed to be swallowed	Cough with occasional hemoptysis, weakness, and other symptoms suggesting tuberculosis	Six years	Hygienic and tonic	Tooth coughed up during attacks of coughing due to severe cold. Symptoms disappeared rapidly		Bronchoscopy not attempted
Schlittler, E.	35M	Nerve canal reamer 5 to 6 cm. long	Bronchus the right lower lobe X-Ray findings	Dropped into throat in the dental chair, later pushed down in an unsuccessful attempt to remove it.	None	3 mos. at the time of attempted bronchoscopic removal. Patient reported again 1 mo. later	Unsuccessful bronchoscopy under local anesthesia foreign body not found when indicated by X-Ray	No symptoms at any time, & physical X-Ray examination showed lung normal		Bronchoscopy not successful
Smith, H.	?M	Dental burr	Upper outer lobe left lung	Drilling tooth dentist dropped burr	None	A few days	Four unsuccessful bronchoscopies partial pneumonectomy	Death followed operation, burr obtained		Dr. Jackson was of the opinion that owing to the position of the burr, it could not be removed with the bronchoscope
Sander, (cited from T. A. Hoffman, Nothnagel's practise of Medicine)	20F	Portion of tooth	Right bronchus	Extraction of teeth	Dyspnea and cough	One month	No surgery	Coughed up. Death		Records not complete. Bronchoscopy not attempted
Schulz, J.	47M	Molar tooth	Bifurcation of two bronchi in right lung	Aspiration of tooth (not stated whether during extraction or not)	Cough and purulent expectoration, occasionally blood tinged, pain dyspnea, weakness	About a year and a half	Rib resection and drainage	Temporary improvement followed by return of symptoms, death	Advanced tuberculosis in both lungs with large cavity in right bronchiectasis. Tooth found in bronchial bifurcation	Bronchoscopy not attempted

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Schulz, J.	23F	Tooth root	Not stated	Aspirated during extraction of teeth	Those of lung abscess (not detailed)	5 months	Rib resection and drainage of abscess	Presence of tooth caused gangreneous abscess, cured by operation good recovery		Tooth root not found
Shurly, R.		Tooth	Not stated	Teeth extracted under gas	Immediate cough	Not stated	Tracheotomy, bronchoscopy	Foreign body removed, recovery		Bronchoscopy successful
Shurly, R.	?F	Rubber from dental mouth gag	Not stated	Teeth extracted under gas	Immediate symptoms cough, odor of rubber, air to lower lung cut off	Not stated	Bronchoscopic removal	Not stated		Foreign body slipped back into trachea
Shurley, R.	49M	Dental burr	Lower left bronchus	Drilling of teeh	Not stated	10 days	Bronchoscopic removal about 10 days after accident	Complete recovery		Bronchoscopy successful
Strange, W.	23F	Part of tooth	Right bronchus	Unsuccessful attempt at teeth extraction. Part of tooth loosened under gas	Immediate symptoms not stated. Late symptoms of gangreneous abscess	Not stated	Thoracotomy for drainage of abscess, tooth not found	Complete recovery		Bronchoscopy not attempted
Thomson, St. C.	10F	Tooth	Left bronchus	Inhaled from towel on waking after anesthesia under gas	Immediate wheezy respiration, physical examination after several days, very little air entering lung. Late symptoms after 2 mos. fever and other symptoms of abscess	Two months	Two unsuccessful bronchoscopies before abscess formation tracheotomy; lower bronchoscopy, foreign body removed 2 months after accident	Complete recovery		Small absceess cavity behind tooth; pus released on pulling tooth from bronchus
Tees, F.	28F	Tarter from teeth	Right lung	Excessive tarter on teeth some inhaled	Cough with slight expectoration; pain in chest and back on right side	Five days from onset of symptoms	Drainage of pleural cavity on account of pyopneumo thorax	Pyopneouma thorax developed secondary to an abscess of the lung, death	Small piece of tarter found in abscess in right lung connecting with inter lobe abscess and so with pleural cavity	Bacteria in fluid withdrawn from pleural cavity similar to those found around the teeth. Bronchoscopy not attempted
Traversieur	F	Fragment of tooth root		Tooth extraction under general Anesthesia	Cough, dyspnea fetid expectoration fever and weakness	Two months	Not stated	Symptoms indicated a pulmonary abscess; tooth fragment coughed up immediate relief and good recovery		No X-Ray study and no attempt at removal; exact location not determined

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Accident Nature of	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Verco, J. C.	27F	Tooth	Right bronchus	Teeth extracted under gas	Immediate severe cough profuse perspiration fever, pain in chest tasted and smelled tooth. Late symptoms cough, fetid sputum, fever dulness in right base	12 weeks	Symptomatic	No record		About 12 weeks after the accident coughed up tooth bronchoscopy not tried
Verco, J. C.	39F	Tooth	Right bronchus	Teeth extracted under gas	Immediate symptoms, fever, cough, with sputum having odor and taste of bad teeth, late symptoms, cough, fetid sputum, fever	3 weeks	Symptomatic	Expulsion 3 wks. after accident died from suffocation following sudden bursting of abscess		Abscess burst 2 months after tooth extraction
Wallace, T.	M	Tooth plate with 3 artificial teeth	Bifurcation of right bronchus	Aspirated during a fit of coughing	Cough difficulty of, breathing, soreness on right side morning expectoration of purulent sputum	46 days	Not stated	Tooth plate coughed up, improvement but some expectoration persists		
Webster, A. E.	?	Tooth root	Right lung	Teeth extracted under gas anesthesia	Cough increasing in severity and frequency, purulent expectoration with some blood. Nervousness and weakness	About 5 mos.	Symptomatic largely sedative	Tooth root coughed up, improvement followed but some cough and expectoration continued		The X-Ray showed a small opaque shadow both before and after the tooth was coughed up Its nature was not determined
Wall, C.		Tooth stump	Not stated	Aspirated while under anesthesia	Early symptoms cough with purulent expectoration	Not stated	Bronchoscopy attempted on 2 occasions but failed	Not stated		Two unsuccessful bronchoscopies
Warrack, J. S.	26F	Tooth	Left bronchus	Teeth extracted under gas anesthesia	Immediate symptoms, extreme cyanosis, tightness of throat dyspnoea hard, dry paroxymal cough, wheezy respiration. Late symptoms hectic temperature 13th day offensive breath, brown, foul smelling sputum cough	16 days	None	Died 16 days after accident	Complete obstruction of left main bronchus whole lung gangrenous crowned bicuspid tooth wedged into bronchus ball value obstruction	Bronchoscopy not attempted X-Ray picture not made

Dental and Surgical objects (continued)

Author	Age Sex	Foreign Body	Location	Nature of Accident	Symptoms	Sojourn	Treatment	Results	Post Mortem	Remarks
Wigg, A. E.	30F	Tooth	Right bronchus	Tooth slipped from forceps during extraction of teeth	Immediate slight cough, late symptoms violent cough, purulent sputum, haemoptysis fever, pain in chest, dulness in right base	3½ weeks	Thoracotomy performed to facilitate expulsion	Died 3 ½ wks. after accident	Large empyema small abscess in middle lower lobe, bicuspid, tightly impacted	Bronchoscopy not attempted X-Ray negative
Wall C.	37F	Artificial tooth plate	Right bronchus	Not known how it was inhaled no dentistry at the time	Cough with copious expectoration wasting, night sweats	Over 9 mos.	Symptomatic	Secondary bronchitis and bronchiectasis death due to latter	Tooth plate found in right bronchus secondary bronchiectasis of right lower lobe Septic pneumonia in left lung	Bronchoscopy not attempted. Remarkable that a large foreign body inhaled in to the bronchus produced no symptoms until secondary bronchitis developed
Wall, C.	?F	Stump of tooth with two fangs	X-Ray did not show foreign body	Teeth extraction under gas	Cough with copious expectoration, ofensive sputum	Two and half years	Symptomatic	Bronchiectasis developed. Tooth coughed up, symptoms relieved. Recovery		Cough did not begin until 13 months after tooth extraction. Bronchoscopy not attempted
Clayton, T. A.	40F	Molar tooth	Right bronchus lower lobe	Not stated	High fever	Not stated	Tracheotomy, removal by bronchoscope thru opening	Recovery		Bronchoscopy successful thru tracheal opening
Not stated (cited from G. B. Wood, Phil M. M. 1899)	??	Tooth	Left bronchus	Not stated	Not stated	Not stated	Symptomatic	Death		Bronchoscopy not attempted
Not stated (cited from G. B. Wood, Phil. M. M. 1899)	??	Tooth	Lung	Lost during extraction of teeth	Not stated	Not stated	Thoracotomy for lung abscess	Recovery		Bronchoscopy not attempted
Not stated (cited from G. B. Wood, Phil. M. M. 1899)	??	Tooth	Left bronchus	Lost during extraction of teeth	Symptoms of bronchitis	13 days	Removed by operation nature not stated	Recovery		Does not state nature of operation but most likely thoracotomy

but the patient and her family dismissed it as being lost. Shortly following the accident the patient began having an itching and tickling sensation in her throat, which gradually developed into a cough and became steadily worse, more so at nights. Eighteen months after this injury the patient was bending over in order to clean a spring house and at this time had a hemorrhage. She had hemorrhages at various intervals since, but only when stooping over. The patient's chest was X-rayed at the sanitarium where she was being treated and the presence of a foreign body was discovered in the right bronchus. She was then questioned as to the history of having aspirated a foreign substance into her lungs and recalled that she had broken her dental plate five years before and that a small portion of it was lost at the time of the accident.

I referred the patient to Dr. J. T. McK. for further X-ray examination and the following is his report:

"Stereoroentgen examination, with antero-posterior and postero-anterior plates of I. F.'s, chest shows a foreign body more or less oblong in shape, about 1¼ c.m. by 1 c.m. in size, lying obliquely in the inferior or descending branch of the right bronchus, the foreign body is lying opposite the ninth rib using posterior markings and opposite the fourth interspace using the anterior markings. There is considerable pathology noted at the base of the right lung, involving to some extent the parenchyma of the lung, a small emphysematous area present. There is a marked peribronchial thickening and fibrosis of the branches of the descending bronchi. The possibility of there being a few adhesions around this foreign body should be taken into consideration. No definite areas of tuberculous infiltration are seen in either lung."

The following is report of Dr. B. L. T., physician in charge at the tubercular sanitarium where the patient was treated.

"On admission to the sanitarium she gave her history as follows: Usual diseases of childhood, good recovery. Otherwise negative. Was perfectly well until five years ago. Illness began with tickling in throat, had cough, profuse expectoration, small hemorrhages, loss of strength, night sweats, with moderate rise of temperature at times. This patient was diagnosed as having tuberculosis and was admitted to another sanitarium. I have no record of her exact stay at this institution but I think it was at least three weeks. She was admitted to our sanitarium Apr. 2, 1919. Physical examination showed a few fine rales in the right apex with slight broncho-vesicular breathing and slight increased whispered fremitus with dullness. In the right back she had a few scattered rales from the third to the sixth dorsal spine. On admission, her sputum showed positive Gaffky two. The

day after admission, she had a pulmonary hemorrhage of about a dram of blood. She continued from time to time to have heavy streaks or slight hemorrhages, none of which exceeded an ounce during her stay here. Cough was severe and expectoration profuse in the morning. During the rest of the twenty-four hours, cough and expectoration slight. She had several convulsions, which were probably epileptic in character. This patient was kept in bed almost continuously on account of her tendency to hemoptysis. Her symptoms did not appear to improve after several months continued rest in bed, but on the other hand her expectoration increased in amount. The profuse expectoration and the slight physical findings led us to believe that possibly this patient had a deep seated cavity or a bronchiectasis and she was advised to have stereoscopic X-ray plates taken. The X-ray showed a foreign body in the right lung behind the fifth rib. This body appeared to be something over a half of an inch in diameter and gave the appearance of possibly being a flattened bullet of about a .32 caliber. On close questioning the following facts were brought out which the patient did not give in the history on admission. She said that about seven years ago she was walking behind a man who was cutting wood and was accidentally struck over the right eye by the pole of the axe. Since that time she had been subject to fainting spells, which we had diagnosed as epilepsy. And that about five years ago in one of these attacks she crushed her plate of false teeth. After the attack was over she felt as if a part of this plate had lodged in her wind pipe and that her cough and expectoration dated from about that time. Repeated examinations of her sputum were constantly negative except the first examination which was made on admission. The patient was advised to have an operation performed to have this foreign body removed."

On Feb. 29, 1920, I sent the patient to the hospital and on Mar. 1, 1920, under ether anesthesia, I removed the foreign body from the right inferior bronchus. Time of operation, ten minutes. I used the Jackson adult bronchoscope and Jackson's alligator rotation forceps for extraction of the foreign body. The adhesions surrounding the foreign body were very adherent and when the foreign body was pulled away a slight hemorrhage followed. I am greatly indebted to Dr. J. T. McKinney for his accuracy in locating this foreign body and for the skillful manner in which he used the fluoroscope at the time of the operation. Patient had a slight hemorrhage following the operation. There was a slight elevation of temperature for two days. The uncontrollable cough from which the patient had suffered for the preceding five years disappeared the second day following the operation, not to return.

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See also HEDBLOM, M'GREGOR, MARTIN and TRAVERSIEUR, under Case Report.

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TWO INTERESTING FOREIGN BODY CASES.

Dr. Morris E. Newman, Buffalo, N. Y.

Case 1: J. S., male, age 55, inmate in a state mental institution, weight 325. History shows that reference was made by the patient that he had swallowed a nail some three weeks previous but had immediately refused the statement. In as much as he showed no outward symptoms, little attention was paid to him. He seemed to enjoy his meals and had no respiratory distress. About three weeks later he complained of gastric discomfort and difficulty in breathing. An indirect mirror examination was made by one of

the staff men, but no pathology was seen. Increase in symptoms called for an X-ray examination, which showed a curved nail was lodged in the upper part of the esophagus. Attempts at removal, both under local and general anesthesia, were to no avail, by the indirect method, even though the nail could be felt in the forcep's grasp. The writer was called to see the case a few hours after. An ether anesthesia had been given, so there was little difficulty in passing an esophagoscope. The posterior pharyngeal wall, epiglottis, arytenoids and esophageal opening were edematous. Just above the second constriction of the esophagus the curved shaft

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of the nail was seen, with both ends pointing upward and through the mucosa. Many points of ulceration were demonstrated. Due to the poor condition of the patient and in the presence of such a large amount of edema, no attempt at removal at this time was made. Patient was sent back to ward with instructions to pack neck in ice and remove him into the city, where closer watch could be made. Early the next morning the symptoms of dyspnea increased, followed by a state of coma, and in spite of a hurried tracheotomy the patient expired.

An autopsy was performed and palpation of the esophagus, *in situ*, revealed both ends of the nail through the wall. Section showed four ulcerations, two from the shaft and two from each of the points where they exited.

The unusual feature of this case is the absence of pain for such a long time and the ability to eat in the presence of so large a foreign body. Our attention must be called to the importance of early X-ray examination and the early removal of foreign bodies with instruments devised for that type of work.

The photographs herewith demonstrate the condition of the tissues above and about the foreign body, the position of the nail, and the areas of ulcerations.

Case 2: Helen H., age 5. Had a persistent cough, expectoration and loss of weight continuing over a period of seven months. The parents were informed the youngster was a victim of tuberculosis and preparations were being made to send her away for this condition. One evening the child was taken with violent coughing and shortness of breath. The family not being able to locate their regular physician, called a nearby physician. He succeeded in quieting the youngster and ordered an X-ray in the morning. Same was done and the result is shown herewith in the photograph.

Bronchoscopy was performed under local anesthesia and the foreign body, which was a many-sided red glass bead, was removed from the right main bronchus.

All coughing and expectoration has disappeared, the child has gained weight rapidly and is the picture of health.

Attention must be drawn in this case to the need of more careful examination with the viewpoint of possible foreign body lodgments and the urgency of early X-ray diagnosis.

468 Delaware Avenue.

IMPROVED LOCAL ANESTHESIA FOR BRONCHOSCOPY IN ADULTS.*

DR. M. C. MYERSON, Brooklyn, N. Y.

More and more the importance of bronchoscopy and esophagoscopy becomes recognized. It is no longer limited to the mechanical, although life saving removal of foreign bodies, but it has become a factor in the diagnosis as well as in the treatment of conditions that have heretofore resisted all our efforts toward cure. Any advance or improvement that will make for the greater comfort or ease of the patient should be presented and improved upon, if requisite.

In this connection the writer presents an improved technic for the application of local anesthetic in performing bronchoscopy in adults. This improved technic refers entirely to the employment of cocain solutions of the proper strength. It has been noted that the application of the solution to the pyriform sinuses does not influence the reaction of the trachea and bronchi to the passage of the bronchoscope

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or instrumental manipulation. We find that the employment of laryngeal applicators of one type or another irritates the tissues and must surely cause some local reaction, for several applications are necessary, and the intensity of the contact is dependent more upon the reflex irritability of the patient's structures than upon the gentleness of the applications. This is particularly so in the region of the larynx. It is not an unusual experience to see a patient cough and expectorate blood streaked mucus immediately after the application of cocain solution in this manner.

The following method gives a total absence of pain and discomfort to the patient.

Following the suggestions made in the report of Emil Mayer's committee on local anesthetics, all solutions used for anesthesia, whether used as a swab, or by any other method, are carefully measured. For swabbing purposes 1 or 2 c.c. of a 10 per cent solution are placed in a graduated measure, so that when the cotton swab is soaked with the solution and pressed out, we can state with a degree of confidence that not less than a certain amount of the cocain solution has been used. In this manner an application of 10 per cent cocain solution is made to the gingival margin of the upper jaw twice, observing a three minute interval. Then with the use of any type of laryngeal syringe that is serviceable, not more than 1 c.c. of a 5 per cent solution is slowly instilled into the larynx just before the patient is placed upon the table! In emphasizing this manner of application we avoid the laryngeal reflex, all the fluid practically remaining, and the former coughing and expelling of solution is avoided; complete anesthesia is produced. Two or three minutes after the laryngeal instillation an intratracheal injection is made of 1 c.c. of 5 per cent solution, none of which is expelled, and all of which finds its way into the tracheo-bronchial tree. This latter introduction of the anesthetic solution gives a thorough and complete tracheo-bronchial anesthesia. The solution apparently not only anesthetizes the carina area, but also finds its way into the larger bronchial elements on either side. The tracheo-bronchial tree has been found to be very tolerant of cocain; this is substantiated by the statement in the report of Emil Mayer and his commitee that the bladder and bronchi are especially tolerant to local anesthetics.

This method of induction of anesthesia is superior to the applicator method in that there is no irritation due to contact.

It is also an improvement upon the bronchoscopic atomizer in that it produces anesthesia completely and rapidly before the introduction of the bronchoscope; while the atomizer is used through a broncho-

scope that is causing the patient to cough and struggle and react to its introduction, a phase that is entirely absent in the proposed method.

That there is assuredly less danger of toxicity and habit formation with the proposed method than with any other, especially as the larger doses formerly used are greatly reduced, and that we have here a technic which is superior can be readily understood.

This method of inducing anesthesia commends itself to the bronchoscopist, first because of the elimination of the distress which is always present to some degree when the present accepted method is employed, and secondly because, by its use the impression that bronchoscopy is dangerous and formidable will be greatly dispelled. This technic has been employed by the writer for over a year. During this time there has been no necessity for a nurse or assistant to hold the patient's shoulders to the table to help control him, as is practiced in most clinics.

The swabbing requires 1½ grs. of cocain. This part of the technic it is thought can be entirely eliminated, the writer having omitted it in the last few bronchoscopies with no undesirable effect. The instillation requires 1½ grs. of cocain, which is indeed a very small quantity.

Thanks are due Dr. Emil Mayer and Dr. Arrowsmith for their kind suggestions.

198 Lincoln Place.

THE WARING SUCTION TONSILLECTOMY—IS IT WORTH WHILE?

DR. FRED W. BAILEY, Cedar Rapids, Iowa.

In considering the various methods used for the enucleation of tonsils, there are two methods which stand far ahead of all others. These methods are the dissection and snare method, and the Sluder method. There are many and various knives used for dissection, various blunt dissectors and various scissors. There are numerous grasping forceps of all designs and snares of all descriptions, but the object of all is the same, namely, to dissect the tonsil loose from its bed and remove it intact with the snare.

There are also numerous modifications of the Sluder instrument, the technique, however, being the same except in the case of Beck's modification.

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*Read at the Sioux Valley Academy of Ophthalmology and Otology, Jan. 14, 1924.

All tonsils can be removed with more or less degree of satisfaction by the dissection and snare method. All tonsils cannot be removed with satisfaction by the Sluder method or any of its modifications. It is true, however, that many tonsils can be removed better by one method than the other, and it is up to the operator to make his choice. Some operators condemn the Sluder technique, usually because they have not given it sufficient trial. Those who use it are very enthusiastic in its results. There is no question but that a tonsil removed by the Sluder method is cleaner than one removed by dissection, and the tonsillar fossa is left in much better shape.

Practically all operators today use one or other of the above methods, or perhaps both.

Now comes Dr. J. B. H. Waring with an article in THE LARYNGOSCOPE, August, 1923, page 587, describing a new method of tonsil enucleation, called the "Waring Suction Tonsillectomy". The doctor has devised a set of glass tubes with an expanded bowl-shaped end which are really a modification of Hurd's tonsil tubes, used in the hyperemic treatment. His technique is as follows:

The tonsil tube is attached to a vacuum pump with about 25 pounds of negative pressure. A snare is thrown over the handle of the tube, the mouth of the bowl is applied to the tonsil, suction turned on, and after the tonsil is sucked up into the glass bowl, the snare is tightened down and the tonsil is thus enucleated. Dr. Waring claims that this method is far ahead of all others, in that it is practically bloodless, there is no danger of injuring the pillars, no danger of injuring the uvula or soft palate, and that the technique is easy to acquire even by a person who has had very little training in throat surgery; also that there is very little post-operative soreness or discomfort.

Having read the article and also having seen these tonsil instruments advertised in various journals, I decided to give the method a trial. I tried the method in 35 cases, all of them under a general anesthetic. I found the following difficulties:

After the tonsil had been sucked into the bowl, one could not see where the posterior pillar or uvula were. One could not tell for sure just what structures were included in the snare loop. The only way one could be sure that the uvula was not engaged in the snare was to grasp the uvula with a forceps so as to hold it out of the way. Contrary to the doctor's statements, there was not high visibility, but rather the contrary. As soon as the tonsil was sucked into the bowl, the contents of the tonsillar crypts were evacuated onto the surface of the tonsil and into the glass bowl. As soon as

the snare was tightened, the tonsil disengaged from the bowl and the tonsillar debris ran down into the throat. It was necessary then to grasp the tonsil with a forceps so that when it was finally cut loose, it would not fall into the throat. As a rule, the tonsil came out not clean, but with considerable muscle tissues from the constrictors of the pharynx attached to it. I think the reason for this was that the center of the tonsil is sucked up into the tube farther than the edges, carrying with it the muscle tissues to such an extent that the snare loop did not follow the capsule of the tonsil. It was difficult to keep the pillars of the tonsil from being sucked up into the bowl, and in some cases the Waring technique had to be abandoned and some other method resorted to. The tonsillar fossa bled just about as freely as if one had performed the Sluder operation. Considerable difficulty was encounterd in keeping track of the suction tube and the snare at the same time. Also these instruments took up a great deal of room in the patient's mouth.

In doing the second tonsil, it was found difficult to engage the tonsil in the bowl when the suction was turned on because of the presence of mucus and blood in the throat, which made the glass so slippery that the tonsil would not engage. However, by wiping the tonsil dry and the bowl dry, this was practically overcome.

Dr. Waring writes as follows:

"Advantages of the operation over existing techniques, are that it is so simple the operator of even limited experience can operate rapidly, safely and with uniformly good results; while the expert can do better, cleaner and more rapid enucleations by this method. Where rapidity is desirable, either tonsil may be enucleated in less than one-half a minute, and with good, clean fossae convalescence is rapid, the pillars intact and a most grateful patient with little complaint of post-operative sore throat.

High visibility is another strong feature of the operation; at all states of enucleation, the operation is under direct inspection of the operator. It is practically bloodless in all cases, so that no time is lost in attention to post-operative hemostasis. It is so rapid as to be practically shockless, even in the neurotic or aged, and time under general anesthetic markedly shortened. It renders tonsillectomy essentially a one-man job, and does not require the elaborate array of tonsil instruments sometimes seen at tonsil operations. The technic is simple, easily acquired, and does not require the prolonged training and experience necessary to attain competency with some of the existing tonsil operations. It is equally applicable to all types and

sizes of tonsils, but is of especial value in the deeply submerged and adherent tonsil, so difficult of attack under ordinary methods."

My findings in the few operations which I tried were quite in contrast to those that the doctor sets forth. He states that a person who has had scarcely any training can perform the operation easily and with dexterity. I have had the experience of over 6,000 tonsillectomies, and yet I could not perform his operation with any degree of satisfaction to myself or the patient. I am quite sure that the technique is harder to acquire than the Sluder technique, and feel that the beginner would be far safer to try to learn the dissection operation first. It is true that some cases came out with excellent results. These were cases where the anterior and posterior pillars were not attached to the tonsil, and where almost any operation would have been easy and where one could have enucleated the tonsil completely with a snare and no dissection. In some cases it was impossible to suck the tonsil into the bowl, no matter how much pressure was turned on.

Dr. J. E. Stansbury, who has been working with me for some years, tried the technique on fifteen cases, with about the same results that I have had. Another doctor told me he bought the instruments and tried them, but was afraid to tighten down on the snare because he could not tell what he had included in its grasp.

I do not wish by this paper to detract any credit from Dr. Waring and his new operation. Perhaps it is all my fault. Perhaps the doctor has been over-enthusiastic in his description of the simplicity of the operation. When Sluder first described his new technique, he made the statement that the operation was simple. Two years later he came out with another paper, saying that he had made no change in his technique, but wished to correct the statement that the operation was simple and say that it was indeed difficult. Perhaps the Waring operation has a certain trick about it which when once acquired makes it simple. I would be glad to hear what any of you who have tried this operation think about the method.

FOCAL INFECTION AND ARTHRITIS.*

Dr. Nathan P. Stauffer, Philadelphia.

At the Presbyterian Hospital, the Nose and Throat Department made an intensive study of 300 patients for focal infections, with special reference to arthritis. Our idea being to ascertain if the patients suffering with arthritis had any definite foci, and if so, where it was most frequently situated.

In the ear, nose and throat section we made repeated examinations by the pharyngoscope, the X-ray and transilluminations, and Escats position to definitely determine which tonsil or which sinus was affected. In a group of 200 arthritics I found that over two-thirds had diseased tonsils, and 25 per cent had sinusitis. By diseased tonsils, I mean tonsils which had caseous deposits protruding from the crypts, coupled with hypertrophy; or tonsils which had encysted abscesses and were markedly hyperemic.

This large number of diseased tonsils in arthritics is certainly a strange coincidence, or a valuable symptom. The question naturally arises, how are they related to the cause of arthritis? The next most common nose and throat lesion was sinusitis, over 25 per cent of the 200 had pus in their nares or post-nares. The striking part of this was the frequency of the posterior set of cells being involved, 45 occurring in the posterior ethmoids or sphenoids. Obstruction of the nose with various deviations of the septum, were almost as great, being just below 25 per cent.

This is important to the rhinologist, as sinusitis was found in so great a percentage of these arthritic cases. The teeth were only grossly involved in 10 per cent of the patients. By that I mean objectively decayed roots, unfilled cavities, pyorrhea, or calcareous deposits covering the teeth. The ears were so seldom involved, as to be almost nil as a factor. In this series, I have divided these patients into the acute and chronic arthritic cases, and the latter I have subdivided into those who can and cannot walk.

In 20 cases of acute rheumatism, I found 50 per cent had diseased tonsils, and 25 per cent had sinusitis. None of these had bad ears, or teeth.

In 49 cases unable to walk the percentage of tonsil trouble was even higher than the acute cases, for 75 per cent of them had diseased tonsils. In 4 of these cases, wonderful results were obtained.

*Read by invitation before the Philadelphia Laryngological Society, May 6, 1924.

For instance, Mr. K., bed-ridden for two years with painful arthritis, and had a small pair of diseased tonsils which were enucleated, and he immediately began to improve, and now four years later is walking around, an advocate of tonsillectomies; Mrs. B., a hopeless bed-ridden rheumatic, who used a dozen kerchiefs daily, had a radical Killian, a modified Killian and two Caldwell Luc operations performed before she was cured; and now three years later she is rejoicing in her ability to walk everywhere. These are apt to make one think all can be cured by these methods, but here comes the strange part, 20 of these 40 crippled patients, or 50 per cent, had had tonsillectomies without any appreciable improvement in their ability to walk, or use their hands and feet.

Of course these are all badly crippled patients, some of them unable to feed themselves, unable to walk, and some unable even to lift their bodies out of bed without assistance, so far advanced are they with ankylosis of the joints.

These deposits are so thick, as to make one lose hope even for any ultimate absorption, it was doubtful if anything would cure them. Their worst symptoms were intense pain, with sleeplessness. These complaints were alleviated, and in most cases cured by either the operation, or the treatment which Dr. Pemberton instituted, or the combination of operation and treatment. In another set of chronic patients, 97 who were able to walk, 45 had diseased tonsils, and 28 had sinusitis, and 25 per cent had deviated septums.

In these arthritics, their chief complaints were sore throats and postnasal dropping. In the earlier arthritic stages, the tonsils were acutely inflamed or hypertrophied; or the sinusitis patients' discharges were more mucoid, or of a muco-purulent character. In the more advanced stages of arthritis, I noticed the secretions were more purulent or the crusting was more pronounced. The patients in the advanced arthritic stages have a peculiar mousy odor to the breath, it is typical of an arthritic patient. It is not a stale breath, nor the breath of the alcoholic habitue. I have never noticed a breath like it except in arthritics.

Their mouths and throats are glazed, even though they do not have a high temperature, and I concluded it must be some change in the blood which makes the mucosa so dry. That we might properly judge the value of these arthritic findings, let us consider 100 cases of consecutive admissions to the hospital medical wards, and consult their diagnostic cards, the prevalence of nose and throat and mouth conditions in those patients. Of these 100, 60 per cent had infections of the nose and throat, 58 per cent had dental infections, and 34 per

cent were genito urinary infections. In the nose and throat infections, the largest number, 43, were diseased tonsils, and 30 had sinusitis. These findings were made in patients who were admitted complaining of heart and kidney conditions, etc. In these 100 patients, 50 per cent had a leucocytosis, and 25 per cent had an anemia.

The most frequent diseases being nephritis, or myocarditis, or a combination of the two. There were many other diseases, such as pneumonia, bronchitis, epilepsy, acute rheumatic fevers, heart block, perinephutic abscesses, hypethyroidosis, etc. These patients came to the hospital seeking relief for a wide variety of symptoms, the routine examinations brought to light the fact that those diseases were combined with or due to other ailments, some of which may have been the exciting cause of all their troubles.

It is again significant to find in these 100 cases, so many nose and throat complaints, 60 per cent having nasal and throat diseases. Therefore may we not say that the nasal mucosa, or the tonsils are many times the entrance for, or exciting cause of many of our common diseases? Possibly you may think they are only secondarily involved, and quite apart from the disabling disease. While I know that an excess of carbohydrates will increase or aggravate arthritis, I am of the opinion it is not the sole cause. I believe worry, exposure to cold, overwork plus lowered resistance, affords the opportunity for some change to take place in the body metabolism, whether it is a bacterial invasion from some foci of infection or some chemical change in the blood, these are problems which we are trying to solve. I know Dr. Pemberton has been unable to find bacteria in the joints, or fluids of these arthritis, but may that not be due to our technique? Koch could not find tubercle bacilli in a chicken's blood because its body temperature was 104°, but he could in a rat's blood, because its temperature is nearer the human.

In the tonsils examined microscopically and cultured the bacteriologist reports the great majority of tonsils as showing diffuse suppurative tonsillitis, and the most common bacteria being in their order: *1*, streptococcus—non-hemolyticus; *2*, streptococcus—hemolyticus; *3*, streptococcus—veridans; *4*, staphylococcus aureus; *5*, pneumococci; *6*, bacillus proteus.

Possibly these bacteria may secrete a poison which circulates in the blood or serum, even though the bacteria are not actually present in the tissues in sufficient numbers to be found when an arthritic joint is tapped.

In concluding I would emphasize, first, the large percentage of diseased tonsils in this series of cases, which causes a question as to

whether they may not be a deciding factor. Judging by the acute cases with the large number of tonsil diseases, the tonsillitis may be an early factor which escapes recognition. Possibly the bacteria entering and lodging in the tonsil, or passing through become active and virulent when bodily resistance becomes sufficiently lowered. Tubercular experiments on the common sewer rat were without result, until his bodily resistance had been lowered by excessive exercise, fatigue and a starvation diet, then he became an easy prey.

Second, in the more advanced chronic cases, I believe the bacteria have done their worst and the tonsil removal comes too late. Of course all arthritics do not have discoverable nose, throat or teeth or ear lesions; on the contrary, I can show you many tonsil and chronic sinusitis patients who never show any symptoms of arthritis.

Third, the large percentage of sinus disease cases in this series is another suspicious symptom. I think it is worthy of note and further study, especially the fact that many of them have an acute rhinorrhea, whenever they over-indulge in sugars, tobacco or overwork.

Fourth, the great rush to extract *all* teeth in these poor patients, I think should be discouraged. I have seen many of them with every tooth gone, unable to properly masticate and not a bit improved, old before their time, hopelessly discouraged. I think it a great mistake to remove all the teeth in these advanced arthritic cases, unless they are grossly diseased. Certainly the indiscriminate X-raying and extraction by many inexperienced operators is bound to bring the profession into disrepute unless it is promptly stopped.

Fifth, the indiscriminate tonsil removal is also bad, although their loss is not the hardship on the patient as the loss of all his teeth. In the earlier stages of arthritis, removal of the tonsils may be the decided factor in starting the patient on the road to recovery. In the later stages of arthritis, I question its advisability.

Sixth, the resulting shock of any operation in these hopelessly crippled arthritics is many times the straw which breaks the camel's back, their nervous system being overwhelmed by the surgical shock plus their added exhausting disease. If operation is indicated, it should be done early and after a period of building up.

The author is indebted to Drs. Pemberton, Talley, Sailer and Goodman for the privlege of seeing these patients, and making the collection of these case reports.

2015 Walnut Street.

SUTURING INSTRUMENT.

Dr. Edwin P. Bugbee, Detroit.

While serving as a house doctor in a hospital with a very active surgical service I had the opportunity to observe a great many tonsillectomies. These were done skillfully by many different operators. I noted that even the best operators occasionally encountered cases which bled considerably. This bleeding was difficult to stop and often required suturing. It is a difficult task to place a suture effectively in the back of a throat where the blood hides everything. I saw the need of an instrument which would do this quickly and easily. Figures 1 and 2 are two photographs of an instrument which I have made for this purpose.

Figure 1 shows the instrument assembled and ready for use. It consists of two main parts; a modified pair of hemostatic forceps and a special needle forceps as shown separated in Figure 2. Attached to one jaw of the hemostatic forceps is a bell crank operated by a push rod. The outer end of the bell crank carries a curved plunger. When the push rod is moved it causes this curved plunger to sweep through a similarly curved cylinder. In this way it forces out a small curved needle. This enters a similar cavity between the open jaws of the needle forceps. The needle forceps are attached to the hemostatic forceps in proper position to receive this needle. To explain this better I will describe the operation of the instrument.

A small full curved needle is threaded with fine cat gut or silk and then passed through a small eye on the end of the push rod. Next it is passed through an eye on the jaw of the hemostatic forceps and then passed eye-end first into the curved cylinder. The loose ends of the thread are pulled up into the hollow push rod by means of a small hook, similar to a crochet hook.

The needle forceps are next attached to the hemostatic forceps in the following manner. The jaws of the needle forceps are brought together by pulling on the trigger with the finger and pushing on the knob with the palm of the hand. Each

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jaw is on the end of a rod which slides through the square hollow tube; so sliding the rods in this manner brings the jaws together.

The tips of the jaws are inserted into a cavity in the back of one of the jaws of the hemostatic forceps. When the knob and trigger are released a spring causes the rods to slide, expand the jaws and hold the jaw tips tightly attached to the hemostatic forceps.

The handle end of the needle forceps is also secured to the handle end of the hemostatic forceps. This is done by means

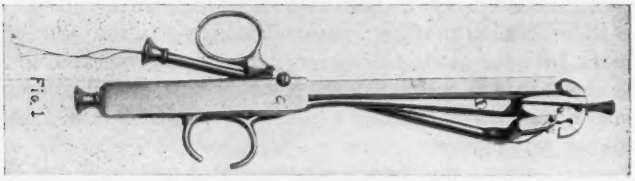
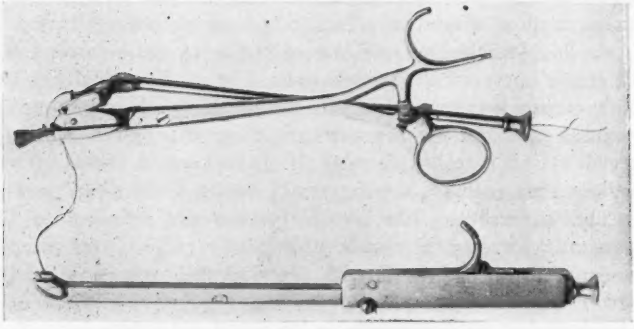


Fig. 1



of a small projecting eye just behind the trigger, so not seen in the photographs. While the trigger is pulled and the knob pushed in, this eye is slipped over the straight end of the altered finger ring of the hemostatic forceps. The spring throws the trigger back and holds the projecting eye firmly in this position. The instrument is now ready for use as shown in Figure 1. Figure 1 shows the instrument grasping a piece of paper between the jaws of the hemostatic forceps as if prepared to sew through the paper.

The assembled instrument is held in the hand in the same manner as any hemostatic forceps.

In using the instrument the surgeon clamps the bleeding point with the jaws of the hemostatic forceps. Then he slips his thumb to the end of the push rod and pushes it quickly. This drives the needle through the tissues. The surgeon then pushes the knob with the palm of his hand and pulls the trigger without changing his grasp. This detaches the needle forceps and at the same time grasps the needle firmly. The needle forceps are withdrawn, pulling the thread through the tissues. This is the condition shown in Figure 2.

The needle holder is then set aside and the knot tied as desired in either of the following ways:

1. The hemostatic forceps may be used as a knot-tier. To do this it is released and partly withdrawn. The needle end of the thread is pulled out of the hole in the jaw of the hemostatic forceps and a half knot or sliding knot loosely tied. The needle and thread are then passed back through the hole in the jaw of the hemostatic forceps. The two ends of the thread are now grasped in the left hand and the hemostatic forceps grasped in the right hand. By pushing the forceps the knot is pushed down into place and tightened. The other half of the knot is then tied in a similar manner.

2. The other way of tying the knot is to remove the hemostatic forceps completely when the tissue is released. The knot is tied and pushed into place with the tips of the two index fingers without the aid of any instrument.

The chief advantages of this suturing instrument are the rapidity and ease with which sutures can be taken.

This instrument, previously threaded and made ready for use, enables the surgeon to complete a suture in a few seconds.

The needle, being positively guided into the jaws of the waiting needle forceps, does away with the difficulty of finding a little needle in a blood soaked operating field.

It is made of non-rusting material and steel nickel plated. It is very easily cleaned and is made in such a way as to be taken apart in a few seconds. In the case of the needle forceps this is done by simply removing the knob and the screw in the handle.

Such an instrument might be of great advantage in other inaccessible places besides the back of the throat.

In places where there is more room to work, several instruments might be used one after the other as hemostats and the sutures completed later when more convenient. By duplication of parts a similar suturing instrument can be made to sew more than one stitch at a time. Also by having a double instrument, carrying two needles, both ends of the suture could be sewed at the same time, thus making a mattress suture. By a slight modification of the jaws the knot could be tied by hand before detaching the hemostatic forceps when making a mattress suture.

281 Philip Avenue.

A METHOD FOR KEEPING AND CARRYING LOCAL ANESTHESIA FOR USE IN ANESTHETIZING THE DRUMHEAD.*

DR. PHILIP S. STOUT, Philadelphia, Pa.

For many years I have hoped that someone would devise a means by which local anesthesia, necessary for anesthetizing the drumhead, could be kept and carried so as always to be ready, of the proper strength, and sterile. If such a method has been devised I have not heard of it. Therefore, I have taken upon myself to bring to your attention a method which, I believe, will be satisfactory. I had this ready for the February meeting, but there was not room for it on the program at that meeting.

As you know, a sealed glass tube is one of the best methods of keeping and carrying any volatile or sterile substance that you desire to have ready when needed. With that thought in mind I have placed in a glass container a mixture of menthol, phenol, oil of cloves and alcohol, equal parts. I will hasten to add that I am aware of the fact that alcohol will, in some measure, interfere with the action of the phenol, but the combination has proven satisfactory in a number of cases. If you desire a still stronger product you can use cocain or anesthesin as one of the ingredients, although I do not think that is necessary in the majority of cases. These tubes are one-half filled

*Read before April, 1924, meeting of Philadelphia Laryngological Society.

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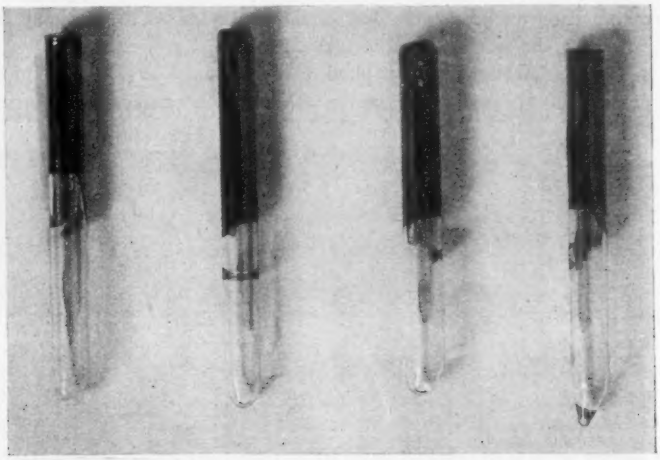
with this mixture and three or more coarse silk threads are placed lengthwise in this tube, and the tube sealed. A scratch is made around the middle of the tube so that it is easily broken when wanted for use. When you desire to use the product break the tube in half, draw out one of the strands of silk thread, place it in the ear well down against the drumhead and leave it there for at least four minutes and not longer than ten minutes. This silk thread is used in



place of absorbent cotton. If both ear drums are to be incised another strand is placed in the other ear. Additional strands are there if one is not sufficient. The knife blade can be inserted in the tube and a certain amount of sterilization can be obtained from contact with the sterilizing properties of the drugs contained therein.

I hope this method will prove satisfactory and will lessen one of the worries of our chosen specialty.

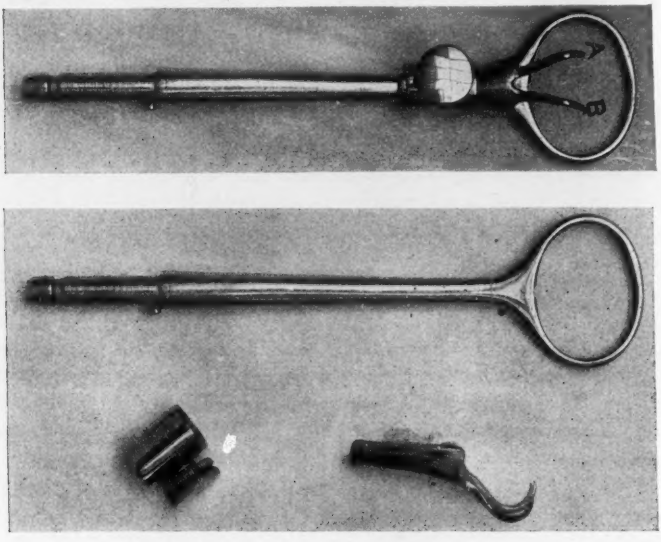
Walnut at Sixteenth Street.

A NEW TONSIL HOOK.

Dr. Noah Fox, Chicago, Ill.

The tonsil hook is an instrument designed for use with the Beck tonsillotome. It consists of two steel hooks A and B (see plate) mounted on an adjustable base, and so situated as to overhang the center of the window of the tonsillotome.

The Beck instrument is applied in the ordinary way, and the tonsil pushed out through the fenester, where it encounters the protruding hooks. As the snare comes down, the tonsil is of necessity, raised from its bed. This impinges the gland firmly on the hook, so that the operation may be completed without resorting to rescuing the tonsil as ordinarily, i. e., by tonsil forceps.



The hook is made to fit any type of Beck fenester, and can be quickly adjusted either to the left or right side. It is made entirely of steel, with no loose parts which might be lost during the operation.

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The advantages of using this hook consists in:

1. It steadies the Beck tonsillotome so that once properly applied there is no opportunity for the instrument to slide about.
2. It shortens the operation of tonsillectomy by doing away with the tonsil forceps.
3. It prevents any possibility of aspiration of the tonsil.

A BRONCHOSCOPIC FORCEPS FOR BALLS, MARBLES, BEADS AND OTHER HARD GLOBULAR OBJECTS.*

DR. GABRIEL TUCKER and DR. LOUIS H. CLERF, Philadelphia.

Many cases of foreign body in the bronchi and esophagus have come to the Bronchoscopic Clinics with a statement from the bronchoscopist referring the case, to the effect that no forceps would hold on the foreign body in the case sent. For this reason we deem it worth while to state that we have a variety of forceps some one or more of which will be found well adapted to hold any kind of foreign body. The great trouble with our predecessors in almost all cases is inadequate equipment. The absolute limitations of bronchoscopy imposed by the small lumen of the bronchi, about the size of a straw in a 6-months old infant, are such that success necessitates that instruments shall be suitable to the requirements of the particular case. For instance a forceps that will hold a bone securely will comminute a peanut kernel without permitting any tractive effort; a forceps that will grasp and hold a lead bullet will be absolutely useless in case of a jacketed bullet; the forceps that will securely hold the globular lead bullet will be utterly useless in case of a steel ball bearing or a toy marble of the same size.

A number of cases of marbles, beads, pebbles, ball bearing balls and similar objects in the bronchi and esophagus have come to the Clinic in a way that leads us to believe that the kind of forceps we use in these cases is unknown to most bronchoscopists. The characteristics of this class of bodies, exemplified by the ball bearing ball, are:

1 A hard surface on which serrations on a forceps jaw are useless because they will not indent. *2* A polished, glassy, slippery surface off which any ordinary forceps will slide. *3* A

*From the Bronchoscopic Clinics, Philadelphia, Pa.

globular shape which makes a declivity in every direction from any point of contact, so that ordinary forceps will inevitably slip off sidewise or proximally. 4 A globular shape that, with any ordinary forceps, even if placed precisely on the poles, makes a pivotal contact, which is always insecure because of swinging, which will dislodge the foreign body from the grasp.

The nearest approach to a satisfactory forceps among those in general use is our plain forceps, often called "forward grasp-

Fig. 1. Schematic cross section illustration of the problem of grasping a steel ball, glass bead or similar hard smooth-surfaced globular foreign body. A, flat-surfaced jaws on the forceps afford only pivotal contact even if grasped over the poles; usually they slip off sidewise so that the poles cannot be grasped. B, the forward grasping forceps, having a small cup in the face of the jaws affords a better grasp. C, ball forceps shown in Fig. 2. The ring-like jaws come well down over the poles, affording a good grasp.

Fig. 2. "Ball forceps" used at the Bronchoscopic Clinics for hard, smooth, glassy, surfaced, globular objects such as ball bearing balls, toy marbles, beads, etc. By going down over the poles to the "arctic" and "antarctic" circles respectively the jaws hold securely for any-justifiable amount of tractive effort.

ing" forceps. These have in addition to the serrations, which are useless for hard, smooth, globular objects, a cup in the center of the face of each jaw.

The best forceps in our experience is that shown in the accompanying illustration. Its jaws are so shaped that all of their tendency is to slip on instead of off; and by going down over the poles to the "arctic" and "antarctic" circles they grasp even a ball bearing ball with the utmost security.

BOOK REVIEWS.

Handbuch der Neurologie des Ohres. Published by Prof. Dr. G. Alexander and Prof. Dr. O. Marburg, Vienna. Edited by Dr. H. Brunner, Vienna. Published in two volumes. Vol I contains 1186 pages, 409 illustrations in text, some colored, 2 colored and 10 black and white tables. Urban and Schwarzenberg, Berlin and Vienna, 1924. Half morocco binding. Price, 75 gold marks.

The past two decades have developed so much scientific activity and thought in the correlation of otology and neurology that the monumental work presented under the direction of such authorities as Alexander in otology and Marburg in neurology should be given a welcome and enthusiastic reception by every thoughtful otologist. The present handbuch is arranged in two volumes, the first on general and the second on special considerations in these fields. The first volume has been recently published and the second will follow shortly.

Alexander and Marburg have associated with them a group of eminent authorities and the volume before us presents a series of consecutive monographs contributed as follows:

I—NORMAL ANATOMY.

(a) Normal Anatomy, including the Descriptive and Topographical Anatomy of the Nerve Apparatus of the Ear, by G. Alexander.

(b) Microscopic Anatomy of the Nerve Apparatus of the Ear, by W. Kolmer.

(c) Embryology, Macroscopic and Microscopic Anatomy of the Nervus Cochlearis, Vestibularis and Cerebellum Cells, the Associated Tracts of the Central Nervous System, by O. Marburg.

II—PHYSIOLOGY AND PSYCHOLOGY.

(a) Physiology of the External and Middle Ear, by Br. Kisch.

(b) Physiology of the Internal Ear and the Central Nervous Tract, and also Sound Localization, by A. Kreidl.

(c) Tone Psychology, by W. Köhler.

(d) Experimental Physiology of the Vestibular Apparatus in Mammals and in Man, by R. Magnus and A. de Kleyn.

(e) Vertigo, by R. Leidler.

(f) Physiology of the Cerebellum, by J. P. Karplus.

III—PATHOLOGICAL ANATOMY.

(a) Pathological Anatomy, of the Nerve-Portion of the Ear, including Anatomical Anomolies; Distribution; The Eighth Nerve and Its Peripheral Ganglion; Pathological Anatomy of the Labyrinth, of the Cochlea, of the Bony Capsule, of the Perilymphatic Tissues and the Intracranial Complications Associated with Diseases of the Temporal Bone, by G. Alexander.

(b) General Pathology of the Central Nervous System, including the Causes and Gross Results of Disease, Changes in the Ganglion Cells, Alterations in the Nerve Fibers, Changes in the Neuroglcia, by O. Marburg.

IV—CLINICAL METHODS OF FUNCTIONAL EXAMINATION.

(a) The Objective Determination of Organic Deafness by Means of Cochlear Reflexes, by A. Cemach.

(b) Acoustic Functional Tests, by H. Frey.

(c) General Symptomology in Diseases of the Vestibular Nerve and of Its Peripheral and Central Ramifications, by H. Brunner.

(d) Nystagmus, by J. Orm.

(e) X-Ray Diagnosis of Diseases of the Ear, by A. Schüller.

Each of these chapters is a completed monograph, written authoritatively, exhaustively, excellently illustrated and includes bibliography carried to the present period.

It would require an extensive digest to make a careful analysis of each monograph included in this important work; suffice it to say that the monographs have been prepared by authorities who have gained international recognition in their respective special research; that the entire publication, under the editorship of Dr. Hans Brunner, has been consistently co-ordinated and presented and that Volume One presents as formidable publication in otology as it has ever been our privilege to see.

M. A. G.

The Voice. A Scientific Study of Its Formation and Emission and Its Ailments, by Dr. J. Baratoux. With 160 Illustrations. Published by Les Grandes Editions Musicales, Ltd., Paris. 1925. Price, $2.50.

Baratous combines the unusual advantages of a laryngologist and master of the art of singing and presents in this treatise of twenty chapters in 240 pages a practical and interesting scientific study of the voice, its formation, its production and its ailments.

The chapters include: The Voice; Formation of Sound; A Novel Theory of Voice Function; Study of the Vowels and of the Consonants; Experimental Phonetics; Voice Technique; The Vocal Registers and Compass; Articulation; Experimental Voice Control; Auditorium Acoustics; Change of Voice; The Study of Singing; Misuse; Vocal Hygiene; Diseases of the Vocal Organs, and The Laryngologist versus the Singer.

There are many interesting thoughts expressed in these pages and there are also some rather unusual theories advocated. The English text is a rather poor translation of the original French; the illustrations are ample.

M. A. G.

Diseases of the Nose, Throat and Ear (Fifth Edition). A Manual of the Diseases of the Nose, Throat and Ear. By E. B. Gleason, M.D., LL.D., Professor of Otology, Medico-Chirurgical College Graduate School. University of Pennsylvania. Fifth Edition. Thoroughly Revised. 12mo of 660 pages with 212 illustrations. Philadelphia and London: W. B. Saunders Company, 1924. Cloth, $4.00 net.

The fifth edition of this little book is somewhat larger in size than the previous ones. This is due to the fact that the context of the book has been thoroughly revised and much new matter in the way of the newer facts and details pertaining to diagnosis and treatment has been added. Designed as it is to supply students and general practitioners with the essential facts of rhinology, laryngology and otology in as concise a form as possible, this book contains perhaps as much material as it is possible to put into any one small text-book.

The arrangement is very good and the author's treatment, especially of disease of the ear and their diagnosis and therapy, is exceptionally well done. That portion of the book dealing with the labyrinth and the various methods of testing its functional integrity is about as clear-cut and concise a statement of this usually somewhat confused part of otology as we have read. The only criticism we have to make of the book is that many of the illustrations are quite old and a more liberal sprinkling of cuts illustrative of technique and actual pathological conditions would have added much to the value of the publication.

A. M. A.

PHILADELPHIA LARYNGOLOGICAL SOCIETY.

COLLEGE OF PHYSICIANS.

May 6, 1924.

Local Infection and Arthritis. Dr. Nathan P. Stauffer.

(*Published in full in this issue.*)

DISCUSSION.

DR. RALPH PEMBERTON (by invitation): Dr. Pemberton said he was very glad to say a few words in regard to Dr. Stauffer's paper, as much of it had been based upon some of his cases at the Presbyterian Hospital. He was in entire sympathy with what Dr. Stauffer had said. Many cases of arthritis are caused by local infection. In the army, for instance, the largest number of patients with arthritis ever studied, more men got well as the result of various kinds of treatment for focal infection. His own patients all have the site of focal infection removed. He cited one case, a woman that he had been seeing with Dr. George Wood, who had had, for ten or fifteen years, various arthritic troubles. She had bad tonsils and poor teeth. When Dr. Pemberton first saw her it seemed to him that it would be unwise to remove the foci just then, so he treated her, and in about two weeks she was free of her symptoms. She then had a few teeth removed, and was sent back to Dr. Wood with the message that as she was only in her early forties, he saw no advantage in having such poor tonsils. Dr. Wood examined her and said he would not take the tonsils out. Something had happened to the tonsils since Dr. Pemberton had last seen them. So he wished to emphasize the fact that there are times when they operate on patients too hastily, and there is much harm done. He thought it unwise to proceed with surgical performances until a patient is in proper condition for it.

Demonstration of Aspirating Laryngoscope. Dr. Wm. F. Moore.

Dr. Moore demonstrated an aspirating laryngoscope, which was a small Jackson model, with an aspirating tube attached. This is made in two sizes, children's and adults'. In cases of pulmonary abscess, they found that the secretion came up in such quantities that it had to be helped out, so the idea was conceived to attach a spiral tube along the opening of the larynx. This can be shoved down into position.

A New Method of Carrying and Applying Local Anesthesia to the Ear Drum. Dr. Philip S. Stout.

(*Published in full in this issue.*)

Preliminary Report of Bacteriological Investigation in Acute Mastoid Infections. Dr. Matthew S. Ersner.

"A Comparative Study of Hearing Test Findings, with Various Instruments, Forks, Monochord, Whistles, Politzer's Acoumeter and the Ondometer." Dr. Douglas Macfarlan.

Tonsillectomy Under Nitrous-Oxide-Oxygen Anesthesia. Dr. Lewis Fisher.

Final Report and Pathological Findings of a Brain Abscess, Following Recovery of Pneumococcic Meningitis. Drs. Henry S. Wieder and Eugene A. Case.

Unerupted Teeth in the Adult. Several Case Reports With Roentgenograms. Dr. Harry A. Schatz.

Several striking cases have occurred in my practice in recent years in which unerupted impacted teeth proved the sole causative factor. It is my endeavor to give this subject prominence rather than to teach anything not hitherto known.

There are several explanations for failure of teeth to erupt naturally: *a*, malnutrition in childhood, whether or not the sequel to scarlet fever, syphilis, or any of the acute exanthematous diseases, is mentioned as one cause; *b*, eburnation of the jaw as a sequel to caries of the six-year molar is mentioned as a cause for failure of the third molar to erupt; *c*, premature extraction, or too tardy extraction, of deciduous teeth where indicated is another cause. Here timely gum lancing is of value. *d*, Another explanation is the retrogressive or degenerative changes in the development of the jaws incidental to civilization. *e*, Still another theory is that misplaced embryonal tissue (tooth-buds) explains inverted or displaced teeth with resultant impaction.

The tooth most frequently found impacted is the lower third molar. Why? Because of the difference in density of the lower jaw as compared with the upper. The upper canines occur impacted next in order of frequency.

The tonsil and adjacent pharynx can become affected as a result of the contusion and infection of the mucosa overlying an impacted lower third molar. Trismus and symptoms simulating peritonsillar abscess have been reported. Death from edema of the glottis is mentioned as a sequel. (Cameron.)

Earache is a common symptom of encroachment on the mandibular nerve by an impacted lower third molar. Also dentigerous cysts can develop from unerupted teeth.

The operation for removal of these teeth is safer and easier if done in early life.

Reference: A paper read by Dr. James R. Cameron before the Lehigh Valley Medical and Dental Societies at Bethlehem, Pa., in October, 1922.